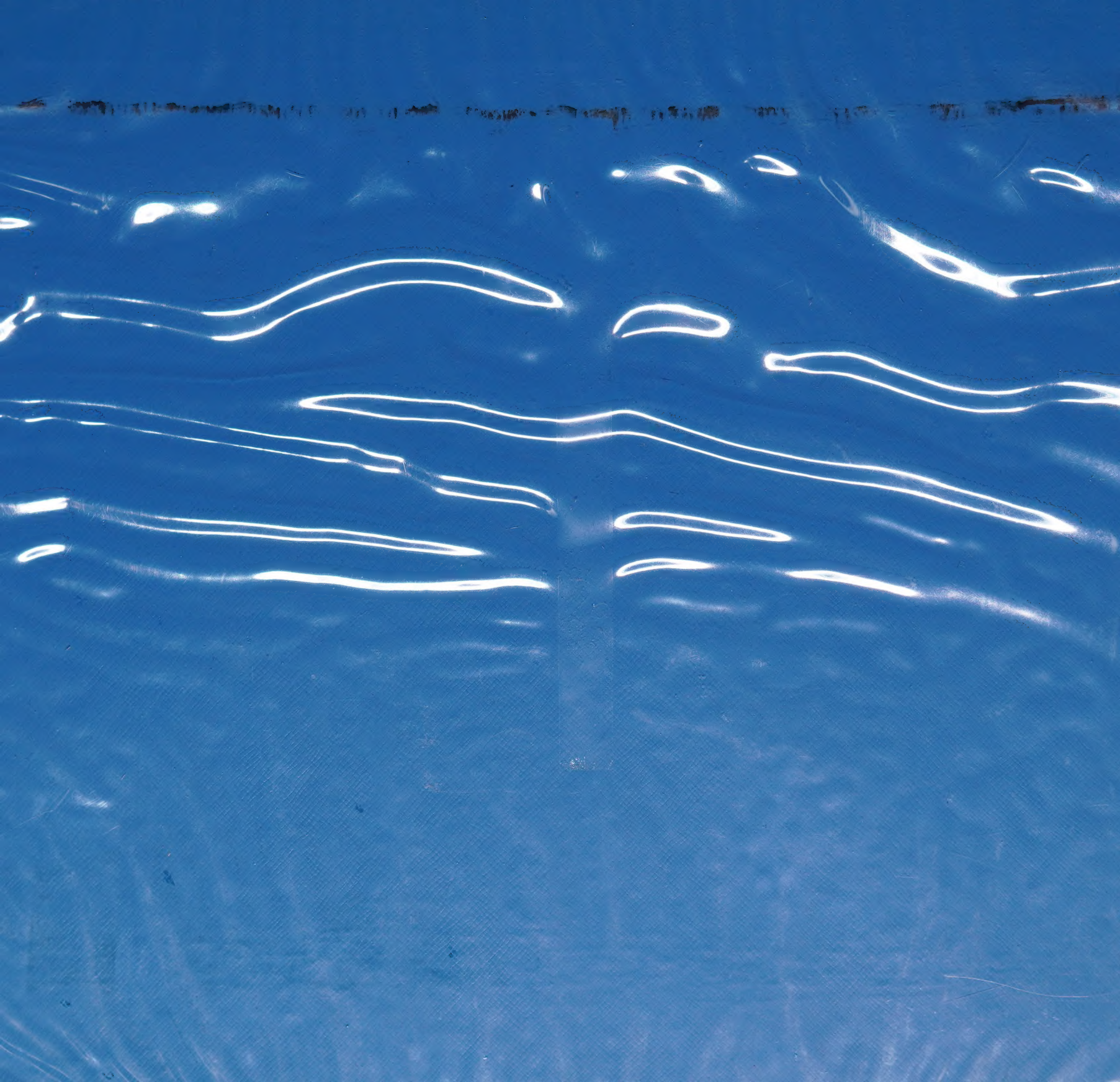

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ADC™
Telecommunications

1400 Test Facility User Manual

Volume 1

Description
Operation

2-33217-0010

Volume 1

ADCP-66-154
4th Edition, Issue 2, November 1984

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Telecommunications

1400 Test Facility User Manual

Volume 1

Description
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2-33217-0010

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2nd Edition Issue 1	11/1/82	Deleted 1460 Module, and Added 1461 and 1462 Modules			
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***Indicates pages changed, added or deleted by current change.**

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INTRODUCTION

This is Volume 1 of the User Manual for ADC's 1400 Series Test Facilities shown on page iv. The manual is arranged in three volumes as follows:

Volume 1—Description and Operation.

Section 1—Description:

- Physical and Functional Description
- Description of Controls and Indicators
- System Specifications

Section 2—Operation:

- Step-by-Step Procedures to Perform Each Test Facility Function

Volume 2—Site Preparation and Installation

Section 1—Site Preparation:

- Test Facility Dimensions and Weight
- Environmental and Power Requirements
- Office Interface Requirements
- Installation Tools and Equipment

Section 2—Installation:

- Uncrating and Inspection
- Physical and Electrical Installation
- Installation/Strapping Options
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- Equipment Requirements and Options
- Equipment/Subassembly Part Numbers
- Assembly Drawings

Section 4—T Drawings:

- Cable and Power Distribution Diagrams
- Cable Assignment Drawings
- Connector/Terminal Block Drawings

Section 5—SD Drawings:

- Schematic Diagrams

Volume 3—Maintenance and Calibration

Section 1—Circuit Description:

- Overall Block Diagram
- General Circuit Description and Theory of Operation

Section 2—Fault Isolation:

- Troubleshooting Tables

Section 3—Repair:

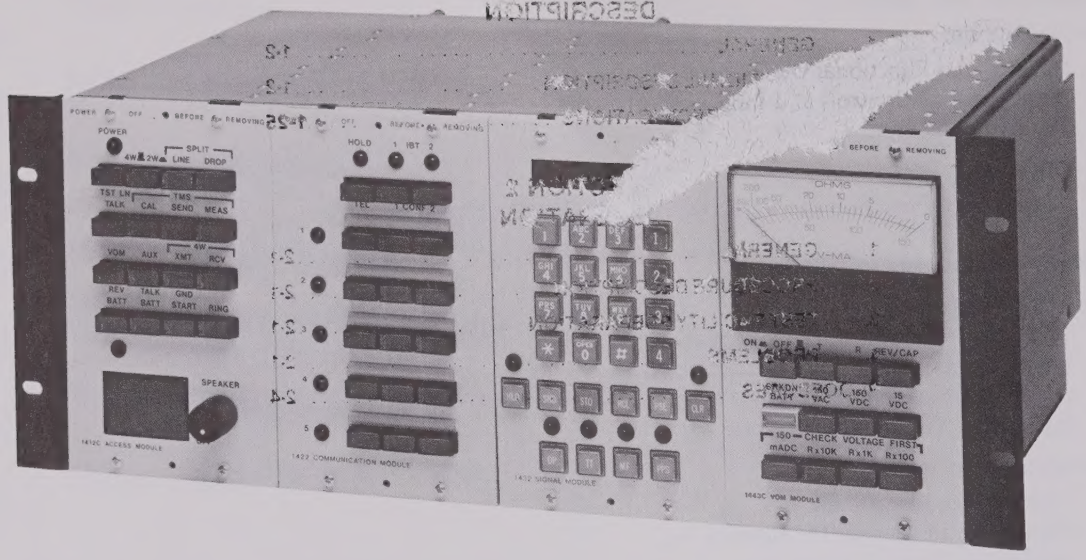
- Module/Subassembly Replacement/Repair

Section 4—Calibration:

- System Tolerances and Calibration Procedures

Section 5—General Information:

- Warranty
- Repair/Exchange Policy and Charges
- Customer Services



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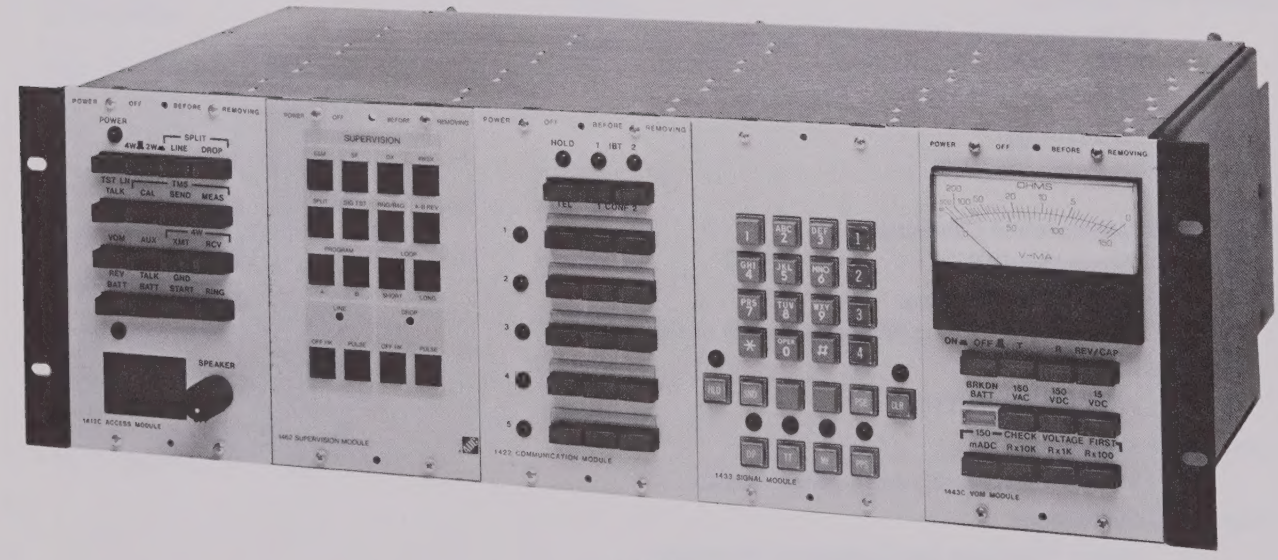

1403

TYPICAL 1400 TEST FACILITIES

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1. GENERAL

1.01 This section describes the 1400 Test Facility, and provides detailed information on all modules available with the system. Options available in each of the 1400 Test Facility modules are also described.

2. FUNCTIONAL DESCRIPTION

2.01 The Model 1400 Test Facility, shown on page iv, is a modular test board providing test and communication capabilities on two, four, and six wire telephone circuits. Circuits tested are private lines, toll trunks, and interoffice trunks in central offices and local exchanges.

2.02 Capabilities of the 1400 Test Facility are dependent on the specific test and communications modules contained within or provided with the system. Available capabilities are:

(a) Monitor and talk functions

(b) Primary, transmission, and signaling tests

(c) Line conditioning and signaling

(d) Trunk seizure

(e) Telephone line communications

TEST FACILITY CONFIGURATIONS

2.03 The 1400 Test Facility is available in two widths for mounting in either a 19- or 23-inch equipment rack. The 19-inch system accommodates up to four test/communication modules, while the 23-inch system holds five modules. In either width, the basic 1400 Test Facility occupies four rack spaces (seven inches), plus space for a Cord Reel Panel and/or Test Access Jackfield. The Test Facility operates on –48 Vdc office battery.

2.04 A fully configured 23-inch 1400 Test Facility consists of the following modules:

(a) 1412C Access Module (included with all 1400 Test Facilities)

(b) 1422 Communication Module

(c) 1432 or 1433 Signal Module

(d) 1443C VOM Module

(e) 1462 Supervision Module

(f) Cord Reel Panel and/or Test Access Jackfield

2.05 The Test Facility may include any or all of these modules, each of which is described in the following paragraphs. Table 1-1 shows the modules required to perform each type of test and communication function. The 1412C Module is included in all Test Facilities.

STANDARD TEST FACILITY MODULES

A. 1412C Access Module

2.06 The 1412C Access Module, shown in Figure 1-1, controls office power to the 1400 Test Facility, and controls selection of two- and four-wire test circuits accessed via a Cord Reel Panel or Test Access Jackfield wired to the Test Facility. It also provides for splitting of a selected circuit to either the line or drop side. The module can be used independently of or in conjunction with other 1400 Test/Communication Modules to perform the functions shown in Table 1-1.

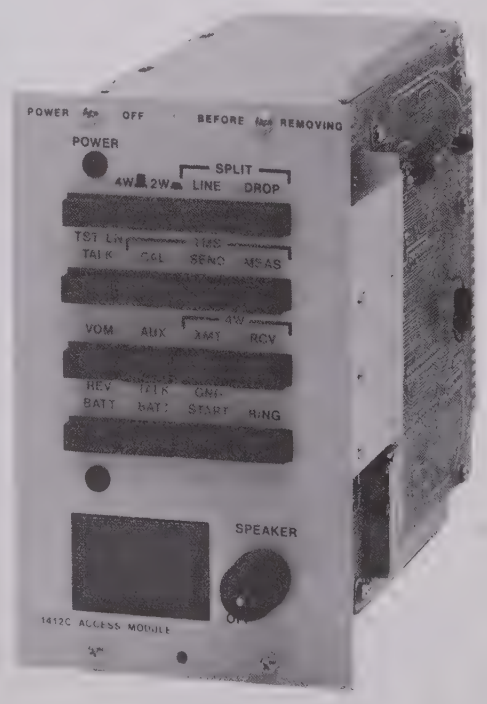

Figure 1-1. 1412C Access Module

Table 1-1
1400 Test Facility Module Requirements

TEST FACILITY FUNCTION	MODULES REQUIRED					
	1412C	1422	1432/1433	1443C/AUX DVOM	1462	AUX TEST SET
Monitor and Talk, 2W and 4W	X					
Send Ground Start, 2W	X					
Send Ground Start, 4W SX	X				X	
Send Ring Signal, 2W	X					
Send Ring Signal, 4W SX	X				X	
Send Talk Battery, 2W	X					
Send Talk Battery, 4W SX	X				X	
Primary Tests, 2W and 4W	X			Either		
Primary Tests, 4W SX	X			Either	X	
Breakdown, 2W and 4W	X			1443C		
Breakdown, 4W SX	X			1443C	X	
Transmission Tests, 2W and 4W	X					Transmission Test Set
Signal Tests, 2W and 4W SX	X				X	Signal Test Set
Loop Signaling, 2W	X		Either			
Loop/B & G Signaling, 2W	X		Either		X	
Loop/B & G Signaling, 4W SX	X		Either		X	
DX Signaling, 2W and 4W	X		Either		X	
SF Signaling, 4W	X		Either		X	
E & M Signaling	X		Either		X	
E & M Signal Tests	X				X	Signal Test Set
Continuous 20 PPS E & M, DX, and SF Signaling	X				X*	
Telephone Line Communication	X	X	Either			

* SF Function must be included in 1462 for SF signaling.

Circuit Access and Split

2.07 An accessed two- or four-wire circuit can be normalled through the 1412C Module for monitoring without interruption, or split for monitoring, talking, or testing on either the line or drop side. When a selected circuit is split, the side that is not selected is terminated to maintain a balanced network and prevent crosstalk. The unselected side of a split two-wire circuit is terminated in 200 ohms, while the unselected side of a four-wire circuit is terminated in 600 ohms. The selected side of a split two-wire circuit is terminated in a high impedance holding coil. Transmit and receive pairs of an accessed four-wire circuit can also be selected independently for monitoring and testing.

Monitor and Talk

2.08 Until split, an accessed two- or four-wire circuit is normalled through the Access Module to provide monitoring on a bridged (non-loading) basis. This allows monitoring of the circuit without interruption to determine, prior to testing, whether it is idle or busy. Circuits can be monitored via the speaker in the Access Module, or via headset plugged into the Test Facility headset jacks. Impedance across the line during bridged monitoring is approximately two megohms. Transmit and receive pairs of four-wire circuits can be monitored individually or simultaneously.

2.09 The 1412C Access Module is shipped with the capability to also monitor the line or drop side of a circuit after the circuit is split. This capability is optional and may be disabled if desired by resetting of two option switches located internally to the module. The capability may be enabled or disabled for either the two- or four-wire circuit independently, or for both the two- and four-wire circuits. Refer to Volume 2, Section 2 of this User Manual for the location and setting of these switches.

2.10 Talk capability, via headset, is provided on the line or drop side of a split two- or four-wire circuit. Talk level coordination on four-wire circuits is provided by circuitry within the Access Module, and is determined by the 1412C part number purchased as follows:

(a) ADC part number 2-42930-0511 or -0512—Automatically attenuates 16 dBm for talking on the transmit pair, and amplifies 7 dBm for talking on the receive pair.

(b) ADC part number 2-42930-0513 or -0514—No talk level attenuation and amplification.

Primary Tests

2.11 The 1412C Access Module provides selection of two- and four-wire circuit pairs for primary testing on the 1443C VOM Module or on a DVOM meter external to the Test Facility. Primary tests which can be performed through or under control of the 1412C Access Module are as follows:

(a) Two-wire Circuits

(1) Measurement of voltage or resistance on the circuit pair.

(2) Measurement of dc current in tip and ring leads of the circuit pair, or in Line or Drop tip-to-ring circuits.

(3) Capacitive kick tests on the circuit pair.

(4) Application of breakdown voltage to the circuit pair.

(b) Four-wire Circuits

(1) Measurement of voltage or resistance on the transmit or receive pair.

(2) Capacitive kick tests on the transmit or receive pair.

(3) Application of breakdown voltage to the transmit or receive pair.

(4) Measurement of voltage or resistance between the simplex leads of a four-wire simplex circuit.

(5) Capacitive kick tests on simplex leads of a four-wire simplex circuit.

Transmission Tests

2.12 The 1412C Access Module provides selection of two- and four-wire circuit pairs for transmission testing on a Transmission Test Set (TTS) external to the Test Facility (similar to ADC's Model 1761 or 1771). Transmission tests which can be performed through the 1412C Access Module are as follows:

(a) Two-wire Circuits

A test tone of known level and frequency can be sent on a two-wire circuit for measurement on a far-end TTS. A test tone can also be received on a two-wire circuit from an oscillator or office milliwatt for measurement on the Test Facility auxiliary TTS.

(b) Four-wire Circuits

A test tone of known level and frequency can be sent on the line transmit or drop receive pair of a split four-wire circuit, and either measured on a far-end TTS, or returned on the line receive or drop transmit pair for measurement on the Test Facility auxiliary TTS.

2.13 The 1412C Access Module also provides for measurement of a TTS test tone before sending it on an accessed circuit. To do this, the TTS oscillator output is routed through the 1412C Access Module, and returned to the TTS for measurement.

Signal Tests and Signaling

2.14 The 1412C Access Module provides selection of two- and four-wire circuits for signaling from the 1432 or 1433 Signal Module, or signal testing at an auxiliary signal test set. Signaling and signal test functions which can be performed through or under control of the 1412C Access Module are as follows:

(a) Measurement of loop or battery and ground (B & G) pulses.

(b) Sending of loop or B & G pulses at a variable rate and break.

(c) Two-wire and four-wire simplex loop and B & G signaling.

(d) Two-wire and four-wire Duplex signaling.

(e) Four-wire SF signaling.

(f) Two-wire and four-wire Touch Tone® and MF signaling.

(g) E & M signaling.

Ring Generator

2.15 The 1412C Access Module provides for connecting the office ringing signal to an accessed two-wire circuit or four-wire simplex circuit.

Ground Start

2.16 The 1412C Access Module provides for seizing a PBX trunk by applying a momentary ground to the ring lead of an accessed two-wire circuit, or to the transmit or receive pair of a four-wire simplex circuit.

Talk Battery

2.17 The 1412C Access Module provides for applying talk battery to either lead of an accessed two-wire circuit or four-wire simplex circuit.

Auxiliary Tests

2.18 The 1412C Access Module provides for connecting an accessed two- or four-wire circuit directly to an auxiliary test unit wired into the 1400 Test Facility. Connection is via pushbutton on the 1412C front panel. As shipped, the Access Module terminates a selected four-wire circuit into 600 ohms, and a selected two-wire circuit into a high impedance hold coil, when the circuit is connected to the auxiliary test equipment. This terminating feature can be disabled if desired, by resetting of two option switches located internally to the module. It may be disabled for either the two- or four-wire circuit independently or for both the two- and four-wire circuits. Refer to Volume 2, Section 2 of this User Manual for the location and setting of these switches.

Controls and Indicators

2.19 Controls and indicators on the 1412C Access Module front panel are shown in Figure 1-2. Callouts in the figure correspond to callouts in the following text. Unless otherwise noted, pushbuttons are of the latching type (press to activate, press to release), with colored mechanical indicators to show the pressed condition.

(1) **POWER**, when pressed, applies office battery to the Test Facility power supply, which in turn provides all necessary dc voltages to each of the Test Facility modules.

(2) **POWER** indicator lights whenever the **POWER** button is pressed and office battery is connected to the Test Facility.

(3) **4W/2W** connects the circuit accessed by the Test Facility four-wire and two-wire line and drop test cords/jacks to the 1412C Access Module and the 1462 Supervision Module for the various tests and functions to be performed by these modules. **4W/2W**, when released, selects the four-wire cords/jacks, and when pressed selects the two-wire cords/jacks. Also, when pressed, **4W/2W** connects the 1462 4W SX coils to the 1443C VOM Module for 4W SX primary tests.

(4)(5) **LINE** and **DROP SPLIT**, when either is pressed, split the accessed two- or four-wire circuit and connects the corresponding line or drop side to test and communication circuitry in the Test Facility. They also terminate the unused side of a split two-wire circuit in 200 ohms, and the unused side of a split four-wire circuit in 600 ohms. The selected side of a two-wire circuit is terminated in a high impedance holding coil.

The selected side of a circuit is connected directly to the 1412C Access Module and the 1462 Supervision Module. If neither **LINE** nor **DROP SPLIT** is pressed, the accessed circuit is normalled through the 1412C Access Module, allowing bridged (uninterrupted) monitoring

(6)(7)(8) **TMS CAL**, **SEND**, and **MEAS** are functional only if the Test Facility contains a Transmission Test Set (TTS) connected to the 1412C Access Module.

(6) **TMS CAL**, when pressed, connects the TTS oscillator output directly to the TTS input, to measure frequency and level of the TTS test tone before sending the tone on an accessed circuit.

(7) **TMS SEND**, when pressed, connects the TTS oscillator to an accessed two-wire circuit or four-wire line transmit or drop receive pair.

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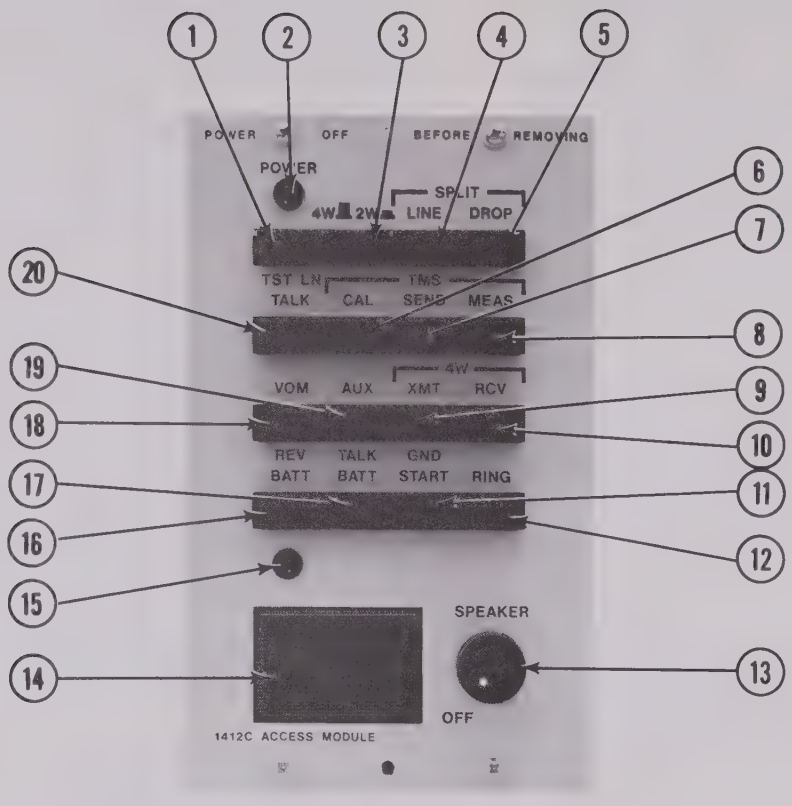

Figure 1-2. 1412C Access Module Front Panel

(8) **TMS MEAS**, when pressed, connects the TTS measure (input) circuitry to an accessed two-wire circuit or four-wire drop transmit or line receive pair.

Note: When testing four-wire circuits, the **TMS SEND** and **MEAS** buttons can be used simultaneously. This permits sending of a test tone on the transmit/receive pair, jumpering the transmit and receive pairs together at the far end, and returning the test tone on the transmit/receive pair for measurement.

(9) (10) **4W XMT** and **RCV**, when either is pressed, connect only the respective transmit or receive pair of an accessed four-wire circuit to monitoring circuitry in the 1412C Access Module. If neither is pressed, both the transmit and receive pair are connected for monitoring. If both are pressed, neither transmit nor receive pair can be monitored.

4W XMT and **RCV**, when either is pressed, also connect the respective transmit or receive pair of an accessed four-wire circuit to primary test circuitry in the 1412C Access Module. If both are pressed, only the transmit pair will be connected for primary testing.

(11) **GND START**, when pressed (momentary contact), applies a momentary ground to the ring lead of an accessed two-wire line or drop circuit or to the simplex transmit or receive pair of a four-wire line or drop circuit. This permits seizure of PBX trunks. The ground is applied as long as the button is pressed.

(12) **RING**, when pressed (momentary contact) connects the office ringing supply to an accessed two-wire line or drop circuit or four-wire simplex circuit. The ring signal is applied as long as the button is pressed.

(13) **SPEAKER** adjusts the listening level of the monitor speaker in the 1412C Access Module. If in the **OFF** position, side tone will be heard in the headset plugged into the Test Facility headset jacks.

(14) Loudspeaker is used for monitoring an accessed circuit.

(15) **REV BATT** indicator indicates talk battery polarity on accessed two-wire circuits and four-wire simplex circuits, and can be used to indicate tip-ring or transmit-receive lead polarity reversal signaling. If **TST LN**

TALK is pressed when a circuit is accessed (loop current flowing), **REV BATT** will light when tip/transmit lead is negative with respect to ring/receive lead, and extinguish when ring/receive lead is negative with respect to tip/transmit lead.

(16) **REV BATT**, when pressed, reverses talk battery polarity applied by the Test Facility to an accessed two-wire circuit or four-wire simplex circuit when **TALK BATT** is pressed. When **REV BATT** is released, polarity is tip/transmit lead ground and ring/receive lead negative. When **REV BATT** is pressed, polarity is ring/receive lead ground and tip/transmit lead negative.

(17) **TALK BATT**, when pressed, applies talk battery to an accessed two-wire circuit or four-wire simplex circuit. Polarity of the applied talk battery is determined by the **REV BATT** button.

(18) **VOM**, when pressed, connects an accessed two-wire circuit or four-wire transmit or receive pair to primary test circuitry in the 1443C VOM Module. **VOM**, when pressed, also connects the 1462 Supervision Module simplex coils to the 1443C for four-wire simplex circuit primary testing.

(19) **AUX** may be used to provide additional test capability on two- and four-wire circuits, and is wired to satisfy specific office requirements.

Note: This button may or may not be functional, depending on office requirements. The button must be released, however, for all Test Facility primary (VOM) functions.

(20) **TST LN TALK**, when pressed, connects an accessed two- or four-wire circuit to communication circuitry in the 1412C Access Module, to permit talking on the circuit after the circuit is split. Talk levels on four-wire circuits are automatically coordinated depending on whether line or drop side is selected. **TST LN TALK**, when pressed, also permits loop current to flow in accessed two-wire circuits, allowing operation of the 1412C **REV BATT** indicator.

B. 1422 Communication Module

2.20 The 1422 Communication Module shown in Figure 1-3 provides the 1400 Test Facility with a communication capability of five telephone lines and two interbay trunks. Additional 1422 Modules may be added to the Test Facility to increase the number of telephone lines and/or trunks available.

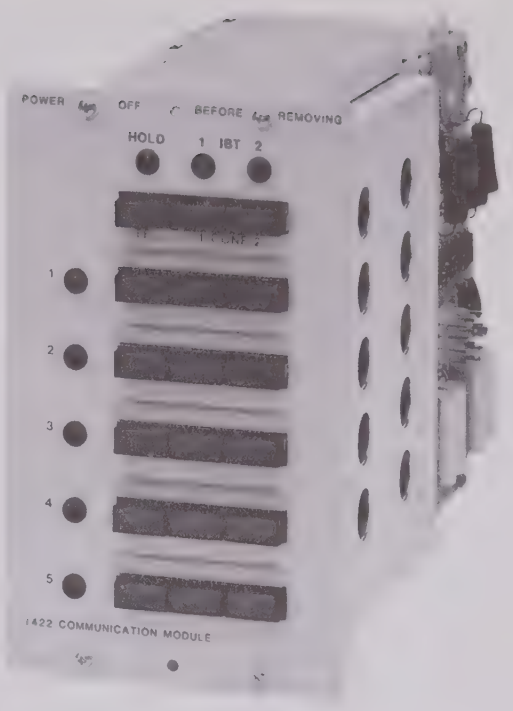

Figure 1-3. 1422 Communication Module

2.21 Four types of 1422 Communication Modules are available as summarized in Table 1-2. The capabilities and characteristics of each of the four types are described in the following paragraphs. As can be seen in the Table, the 1422B, and C Modules are primary units, and can be used independently of any other 1422 Communication Modules. The 1422D and E Modules are secondary units and depend on an accompanying primary unit for many of their capabilities. The 1422D and E Module are used only if the Test Facility also has a 1422B, or C Module.

Receiving a Call

2.22 Each of the five telephone lines connected to a 1422B, C, D, or E Communication Module is provided with a front panel indicator and line select pushbutton. When a call is received on one of the lines, the corresponding indicator flashes and a tone is heard from the 1422 Module. The call is answered by pressing the corresponding line select button, and talking is then possible via headset plugged into the Test Facility headset jacks. The call can also be placed on hold or conferenced to other lines and/or interbay trunks.

Table 1-2
1422 Communication Module Types and Capabilities

TYPE	PRIMARY/ SECONDARY	LINE ACCOMMODATION*	NIGHT ALARM	INTERBAY TRUNKS	AUDIBLE ALARM
1422B	Primary	1A2 Keyset only	Yes	Yes	Yes
1422C	Primary	POTS or 1A2 Keyset	Yes	Yes	Yes
1422D	Secondary	1A2 Keyset only	Only through primary 1422	Extended from primary 1422	Only through primary 1422
1422E	Secondary	POTS or 1A2 Keyset	Only through primary 1422	Extended from primary 1422	Only through primary 1422

*The 1422 Modules can also be programmed for 101 trunks as described in Volume 2, Section 2.

Originating a Call

2.23 A telephone line on which a call is to be placed is selected by pressing a line select pushbutton on the 1422B, C, D, or E front panel. This connects the selected line to the tel bus for the outgoing call. The line is dialed at the Test Facility 1432 or 1433 Signal Module, and talking on the connected line is via headset plugged into the Test Facility headset jacks. The connected line can also be placed on hold or conferenced to other lines and/or interbay trunks.

Audible Alarm

2.24 The 1422B, and C Modules (primary units) have an audible alarm which sounds when a call is received. The 1422D and E Modules have no audible alarm, but are installed to use the alarm in the accompanying 1422B, or C Module. Level and repetition rate of the alarm in the 1422B, and C Modules are adjustable as described in Volume 2, Section 2 of this User Manual.

POTS/Keyset/101 Trunk Service

2.25 The 1422B, and D Modules are usable with 1A2 Keyset Service only, while the 1422C and E Modules can be used with either POTS or 1A2 Keyset. Programming of the 1422C and E Modules for POTS or Keyset service is described in Volume 2, Section 2 of this User Manual.

Note: The 1422 Modules can also be programmed for 101 trunks as described in Volume 2, Section 2.

Conferencing Calls

2.26 Calls on any two or more lines can be conferenced to the tel bus in any 1422B, C, D, or E Module. They can also be conferenced to one or both interbay trunks accessible at any of the 1422 Modules.

Interbay Trunks

2.27 The 1422B and C Modules can each be connected directly to two interbay trunks, and provide the necessary talk battery.

Note: This talk battery can be disconnected if desired as described in Volume 2, Section 2 of this User Manual.

2.28 The 1422D and E Modules do not connect directly to the two interbay trunks, but instead connect to trunk extensions provided by either a 1422B, or C Module.

2.29 A headset plugged into the Test Facility headset jacks is also conferenced to the interbay trunk. If a headset is plugged into either of the interbay trunks (using the appropriate IBT configuration) the corresponding 1422 IBT indicator will light and an alarm will sound until the corresponding IBT pushbutton on the 1422 is pressed.

Note: This IBT alarm can be disabled if desired as described in Volume 2, Section 2 of this User Manual.

2.30 The 1422 Communication Module, as normally shipped, can be used with both two- and four-wire interbay trunks. It can be modified for use with only two-wire trunks as described in Volume 2, Section 2 of this User Manual. This modification disconnects anti-sidetone coils to improve frequency response on two-wire interbay trunks.

2.31 If the Test Facility has more than one primary 1422 Module, they can both be connected to the same two interbay trunks, or can be connected to separate pairs of interbay trunks. Refer to Volume 2, Section 2 of this User Manual for a description of the various connections possible.

Night Alarm

2.32 During hours when the Test Facility is unmanned, the 1422B and C Modules provide for transferring the signal of incoming calls on the tel lines or interbay trunks to an external bell or alarm. The 1422D and E Modules also provide this capability but it is accomplished through a 1422B or C Module.

2.33 The night alarm connections on the 1422 can be wired to provide either normally open or normally closed contacts. The alarm can also be disabled. Refer to Volume 2, Section 2 of this user manual for incorporation of either of these two options.

Multiple 1400 Test Facilities

2.34 If 1422 Communication Modules on two different 1400 Test Facilities are connected to the same telephone line, the line indicator on both 1400 Test Facilities will light when the line is used to receive, originate, or hold a call. Calls may be placed on hold on one 1400 Test Facility, and picked up again on another. If two 1400 Test Facilities are connected to the same interbay trunk, no dialing is necessary to ring either Test Facility.

Controls and Indicators

2.35 Controls and indicators on the 1422 Communication Module front panel are shown in Figure 1-4. Callouts in the figure correspond to callouts in the following text. All pushbuttons except the **HOLD** buttons are of the latching type (press to activate, press to release), with colored mechanical indicators to show the pressed condition. The **HOLD** button provides a momentary contact each time the button is pressed.

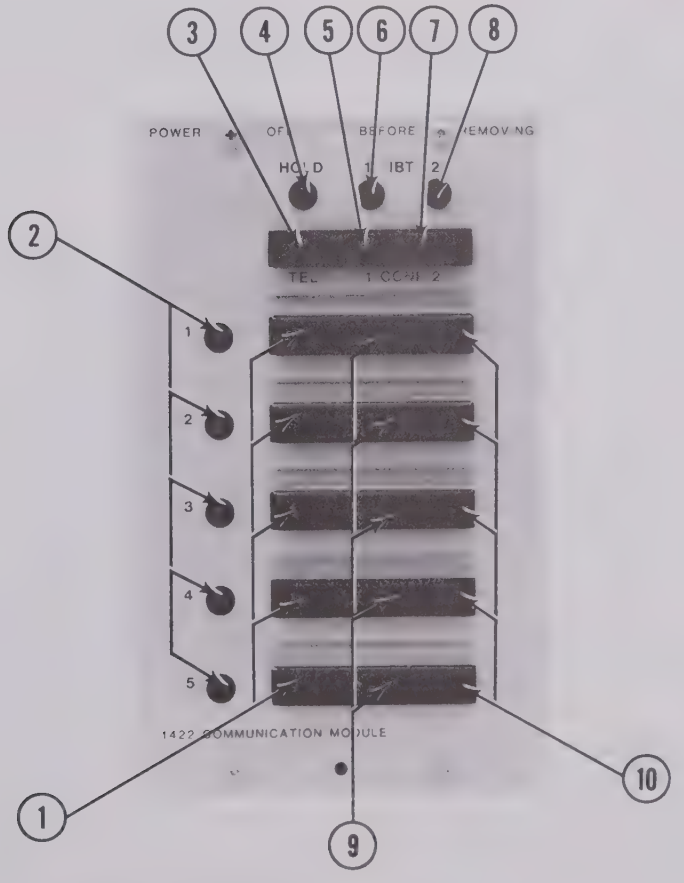

Figure 1-4. 1422 Communication Module Front Panel

(1) **TEL 1, 2, 3, 4,** or **5,** when pressed, connect the corresponding 1422 Communication Module telephone line to the Test Facility headset and to dialing circuitry in the 1432 or 1433 Signal Module. The telephone circuit can then be dialed, and when the connection is completed, talking is possible via the headset.

TEL 1, 2, 3, 4, or **5,** when released, present an idle (on-hook) circuit condition on the corresponding 1422 Communication Module telephone line. This permits a call to be received on that line, and the corresponding **TEL 1, 2, 3, 4,** or **5,** button is then pressed to answer the incoming call. Talking on this circuit is then possible via the Test Facility headset.

(2) **TEL 1, 2, 3, 4,** and **5** indicators show the status of each corresponding 1422 Communication Module telephone line as follows:

(a) Lit steady—The corresponding **TEL** button has been pressed to select that telephone line for an outgoing or incoming call or a call on that line has been connected to conference bus 1 or 2 by pressing the corresponding **CONF 1** or **2** button.

(b) Not lit—The corresponding **TEL** and **CONF 1** and **2** buttons are released and there is no activity presently on that line. An idle (on-hook) condition is presented to that telephone circuit.

(c) Flashing—Flashing rate of the **TEL** indicator is 60 times per minute, and a tone is heard when a call is being received. If the corresponding **TEL** button is pressed and the **HOLD** indicator is flashing, communication via headset is possible on that line; however the line is ready to be placed on hold by releasing the corresponding **TEL** button.

Flashing rate of the **TEL** indicator is 120 times per minute when the call is on hold. If the corresponding **TEL** button is released and the **HOLD** indicator is not lit, communication had taken place on that line but the line is now on hold.

(3) **HOLD** (momentary contact), when successively pressed, causes the **HOLD** indicator to be alternately flashing and extinguished.

HOLD, when pressed to cause the **HOLD** indicator to flash, prepares all active 1422 Communication Module telephone lines to be placed on or removed from hold status. Active lines not presently on hold (corresponding **TEL** indicator flashing and **TEL** button pressed) can now be placed on hold by releasing the **TEL** button. Lines presently on hold (corresponding **TEL** indicator flashing and **TEL** button released) can now be removed from hold by pressing the **TEL** button.

HOLD, when pressed to extinguish the **HOLD** indicator, prevents calls on active lines from being placed on or removed from hold status.

(4) **HOLD** indicator is alternately flashing and extinguished by successive pressing of the **HOLD** button. **HOLD,** when flashing, indicates calls on active lines can be placed on or removed from hold status. Calls are placed on hold by releasing the corresponding **TEL** button; calls are removed from hold by pressing the corresponding **TEL** button. If **HOLD** is extinguished, calls on active lines cannot be placed or removed from hold status.

(5) **IBT 1,** when pressed, connects the Communication Module **CONF 1** bus to the office interbay trunk wired to **IBT 1** on the Communication Module. It also connects the same office interbay trunk to the Test Facility headset.

(6) **IBT 1** indicator lights steady whenever the **IBT 1** button is pressed. This indicates that the 1422 Communication Module **CONF 1** bus and the Test Facility headset are connected to the office interbay trunk wired to **IBT 1** on the Communication Module.

If the **IBT 1** button is released, the **IBT 1** indicator flashes (and an alarm sounds) whenever a headset is plugged into the office interbay trunk wired (using the appropriate configuration) to **IBT 1** on the Communication Module. Indicator flash rate is 30 times per minute. Flashing and alarm continue until the **IBT 1** button is pressed to answer the interbay call.

(7) **IBT 2,** when pressed connects the 1422 Communication Module **CONF 2** bus to the office interbay trunk wired to **IBT 2** on the Communication Module. It also connects the same office interbay trunk to the Test Facility headset.

(8) **IBT 2** indicator lights steady whenever the **IBT 2** button is pressed. This indicates that the 1422 Communication Module **CONF 2** bus and the Test Facility headset are connected to the office interbay trunk wired to **IBT 2** on the Communication Module.

If the **IBT 2** button is released, the **IBT 2** indicator flashes (and an alarm sounds) whenever a headset is plugged into the office interbay trunk wired (using the appropriate configuration) to **IBT 2** on the Communication Module. Indicator flash rate is 30 times per minute. Flashing and alarm continue until the **IBT 2** button is pressed to answer the interbay call.

(9) **CONF 1-1, 2, 3, 4,** or **5,** when pressed, if the corresponding **TEL 1, 2, 3, 4,** or **5** button is also pressed, connects the corresponding 1422 Communication Module telephone line to the **CONF 1** bus. If the **TEL 1, 2, 3, 4,** or **5** button is then released, the corresponding telephone line will remain connected to the **CONF 1** bus until the **CONF 1-1, 2, 3, 4,** or **5** button is released. Any line connected to the **CONF 1** bus will also be connected to an office interbay trunk whenever **IBT 1** or **2** is pressed.

(10) **CONF 2-1, 2, 3, 4,** or **5,** when pressed, if the corresponding **TEL 1, 2, 3, 4,** or **5** button is also pressed, connects the corresponding 1422 Communication Module telephone line to the **CONF 2** bus. If the **TEL 1, 2, 3, 4,** or **5** button is then released, the corresponding telephone line will remain connected to the **CONF 2** bus until the **CONF 2-1, 2, 3, 4,** or **5** button is released, Any line connected to the **CONF 2** bus will also be connected to an office interbay trunk whenever **IBT 1** or **2** is pressed.

C. 1432 Signal Module

2.36 The 1432 Signal Module, shown in Figure 1-5, provides for dialing on telephone lines connected to the 1422 Communication Module, or on circuits accessed via the 1412C Access Module or the 1462 Supervision Module. Dialing is by means of the dial pad located on the front panel of the module. The various signaling and dial control modes possible with the module are described in the following paragraphs.

Figure 1-5. 1432 Signal Module

Signal Modes

2.37 The 1432 Signal Module provides three selectable dialing modes as follows:

(a) Touch Tone (TT) Mode, used for dialing on the 1422 Communication Module telephone lines, or on a two-wire circuit accessed via the 1412C Access Module. The touch dial pad generates tones of standard level and frequency at a rate of 10 or 12 digits per second. Four special purpose pushbuttons in the dial pad provide additional signaling frequencies used, for example, for Automatic Call Director (ACD) access.

(b) Multifrequency (MF) Mode, used to transmit address information between central offices. The dial pad generates MF tones of standard level and frequency for digits 1 through 0, *(KP), and #(ST). Output rate of MF dialing is 7 or 10 digits per second.

(c) Dial Pulse (DP) Mode, at 10 or 20 pulses per second, used for all other signaling functions including:

(1) Dial pulse signaling on the 1422 Communication Module telephone lines.

(2) Dial pulse signaling on two-wire circuits accessed via the 1412C Access Module.

(3) Dial pulse signaling on four-wire simplex circuits accessed via the 1462 Supervision Module.

(4) Dial pulse signaling on two- and four-wire duplex circuits accessed via the 1462 Supervision Module.

(5) SF signaling on four-wire circuits accessed via the 1462 Supervision Module.

(6) E & M signaling on circuits accessed via the 1462 Supervision Module.

Dial Control Modes

2.38 The 1432 Signal Module provides three selectable dial control modes as follows:

(a) Direct Dial—Signaling on the selected line occurs as each digit is entered into the dial pad. Digits can be entered without waiting for a previously entered digit signal to be generated.

(b) Store and Forward—Outpulsing on the selected line is inhibited until all digits have been entered into the dial pad. All entered digits are displayed on the front panel for verification, and then the entire number can be dialed and redialed by pressing only the 1432 **SND** button. This mode is used to redial a number that was previously busy, or to repeat a called number when the connection was not completed. A telephone number of up to 12 digits can be entered in this manner.

(c) Abbreviated Recall Mode—Up to ten 12-digit telephone numbers are stored for future dialing, and each number is identified by a single-digit memory address code. Pressing the 1432 **RCL** button and then entering the single-digit address code causes the telephone number corresponding to the address code to be displayed on the 1432 front panel. The number is then dialed and redialed by pressing only the 1432 **SND** button.

Controls and Indicators

2.39 Controls and indicators on the 1432 front panel are shown in Figure 1-6. Callouts in the figure correspond to callouts in the following text. All pushbuttons have momentary contacts.

(1) The touch dial pad is used to generate dial pulses (DP at 10 or 20 pps and 58% break), Touch Tones (TT), and Multifrequency (MF) tones when the corresponding DP, TT, or MF signaling button is pressed. These signals are used for dialing on telephone lines connected to the 1422 Communication Module, and performing dialing and signal tests on circuits accessed by the 1412C Access Module and the 1462 Supervision Module. Buttons labeled **1**, **2**, **3**, and **4** in the right-hand column of the dial pad provide additional TT signaling frequencies for special applications. The **4** button at the bottom right corner of the dial pad provides Automatic Call Director (ACD) access.

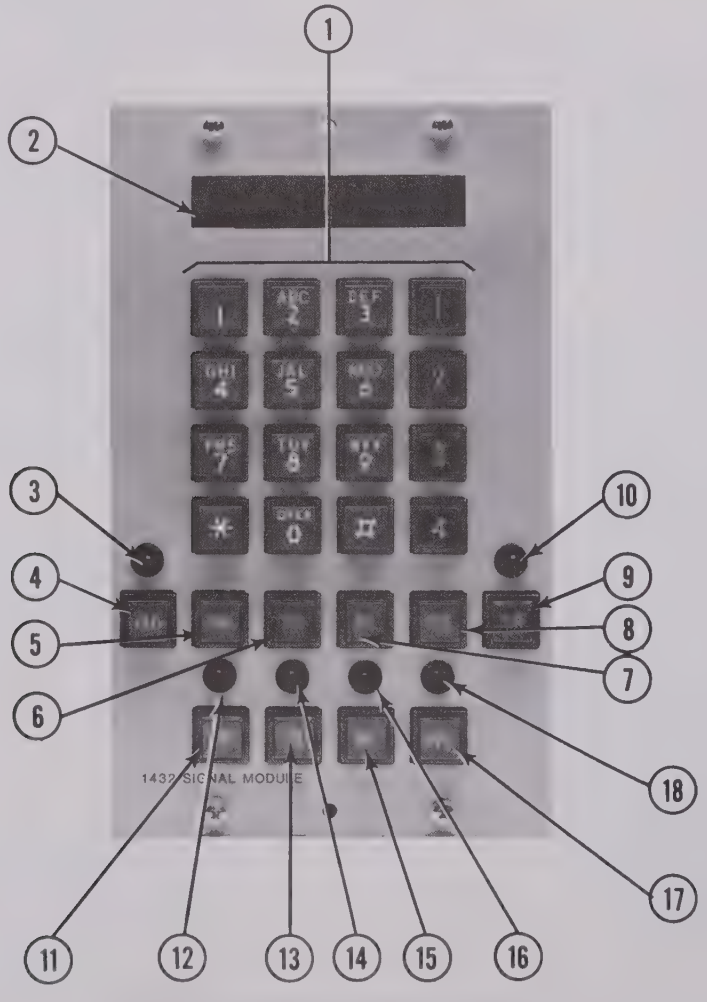

Figure 1-6. 1432 Signal Module Front Panel

(2) The 12-digit numeric display provides a visual indication of the telephone number entered into the dial pad, when operating in the Store and Forward or Abbreviated Recall Mode. This allows verification of the number to be dialed before outpulsing on the accessed line. The numbers continue to be displayed until the **CLR** button is pressed. The display is dark (no digits displayed) when cleared.

(3) **HLD** indicator lights whenever a pause is encountered while the 1432 Signal Module is operating in the Store and Forward Mode.

(4) **HLD**, when momentarily pressed preceding the entry of a telephone number, places the 1432 Signal Module in the Store and Forward Mode. In this mode, the numbers are stored as they are entered, and outpulsing is prevented.

(5) **SND**, when momentarily pressed in the Store and Forward Mode, causes outpulsing of the telephone number indicated in the digital display. Outpulsing of the number occurs each time the **SND** button is pressed. If the entered telephone number includes a pause, outpulsing of the digits following the pause must be reinitiated by again pressing the **SND** button.

(6) **STO**, when held pressed, enables storing of up to ten 12-digit telephone numbers in the 1432 Signal Module memory. Each telephone number and its one-digit access code are entered into the dial pad while the button is pressed.

(7) **RCL**, when momentarily pressed, enables recalling of a telephone number stored in the 1432 Signal Module memory. After momentarily pressing the **RCL** button, entering of the one-digit access code in the dial pad causes the telephone number stored with that access code to appear on the digital display. That number can then be dialed by pressing the **SND** button.

(8) **PSE**, when momentarily pressed, enters an access pause in a telephone number being entered into the dial pad in Store and Forward or Abbreviated Recall Mode. This pause will interrupt automatic outpulsing of the telephone number, to allow receipt of a secondary dial tone necessary to complete some calls. After the secondary dial tone is heard, the **SND** button is again pressed to continue outpulsing.

(9) **CLR**, when momentarily pressed, clears the 12-digit storage register and digital display of the last telephone number entered into the dial pad. This button must always be momentarily pressed to extinguish the **CLR** indicator before entering a number into the dial pad.

(10) **CLR** indicator, when extinguished, indicates that the last telephone number entered into the dial pad has been cleared from the 12-digit storage register and digital display. This indicator must always be extinguished (**CLR** button momentarily pressed) before entering a number into the dial pad.

(11) **DP**, when momentarily pressed, enables the 1432 Signal Module to operate in the Dial Pulse signaling mode. **DP**, when momentarily pressed, also lights the **DP** indicator and extinguishes the TT or MF indicator (whichever is lit).

(12) **DP** indicator, when lit, indicates that the 1432 Signal Module is enabled to operate in the Dial Pulse Signaling Mode.

(13) **TT**, when momentarily pressed, enables the 1432 Signal Module to operate in the Touch Tone signaling mode. **TT**, when momentarily pressed, also lights the **TT** indicator and extinguishes the **DP** or **MF** indicator (whichever is lit).

(14) **TT** indicator, when lit, indicates that the 1432 Signal Module is enabled to operate in the Touch Tone signaling mode. The **TT** indicator is always lit (Touch Tone mode enabled) when the 1400 Test Facility is initially powered up.

(15) **MF**, when momentarily pressed, enables the 1432 Signal Module to operate in the Multifrequency (MF) signaling mode. **MF**, when momentarily pressed, also lights the **MF** indicator and extinguishes the **DP** or **TT** indicator (whichever is lit).

(16) **MF** indicator, when lit, indicates that the 1432 Signal Module is enabled to operate in the Multifrequency signaling mode.

(17) **PPS**, when successively pressed, alternately lights and extinguishes the **PPS** indicator. **PPS**, when pressed to light the **PPS** indicator, increases the rate of signaling when operating in any of the three signaling modes. **PPS**, when pressed to extinguish the **PPS** indicator, returns the signaling rate to standard. Table 1-3 shows the standard and fast signaling rates for each of the three modes.

Table 1-3
Standard and Fast Signaling Rates

SIGNAL MODE	STANDARD RATE	FAST RATE
Dial Pulse	10 pulses/second	20 pulses/second
Touch Tone	10 digits/second	12 digits/second
Multifrequency	7 digits/second	10 digits/second

(18) **PPS** indicator, when lit, indicates that the fast signaling rate has been selected by the **PPS** button. Table 1-3 shows the standard (**PPS** indicator not lit) and fast (**PPS** indicator lit) signaling rates for each of the three signaling modes.

D. 1433 Signal Module

2.40 The 1433 Signal Module, shown in Figure 1-7, provides for dialing on telephone lines connected to the 1422 Communication Module, or on circuits accessed via the 1412C Access Module or the 1462 Supervision Module. Dialing is by means of the dial pad located on the front panel of the module. The various signaling and dial control modes possible with the module are described in the following paragraphs.

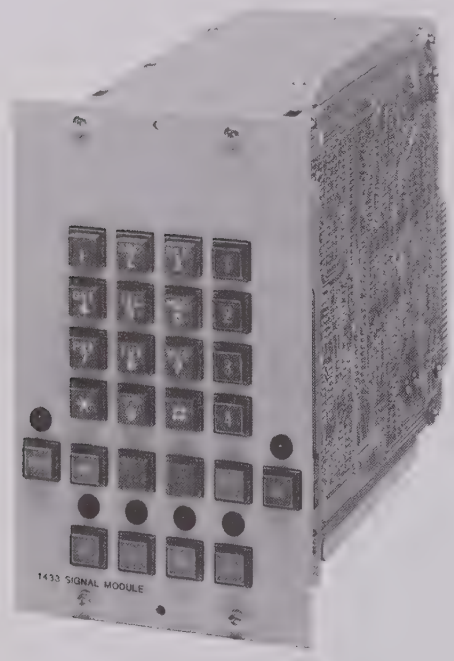

Figure 1-7. 1433 Signal Module

Signal Modes

2.41 The 1433 Signal Module provides three selectable dialing modes as follows:

(a) Touch Tone (TT) Mode, used for dialing on the 1422 Communication Module telephone lines, or on a two-wire circuit accessed via the 1412C Access Module. The touch dial pad generates tones of standard level and frequency at a rate of 10 or 12 digits per second. Four special purpose pushbuttons in the dial pad provide additional signaling frequencies used, for example, for Automatic Call Director (ACD) access.

(b) Multifrequency (MF) Mode, used to transmit address information between central offices. The dial pad generates MF tones of standard level and frequency for digits 1 through 0, *(KP), and #(ST). Output rate of MF dialing is 7 or 10 digits per second.

(c) Dial Pulse (DP) Mode, at 10 or 20 pulses per second, used for all other signaling functions including:

(1) Dial pulse signaling on the 1422 Communication Module telephone lines.

(2) Dial pulse signaling on two-wire circuits accessed via the 1412C Access Module.

(3) Dial pulse signaling on four-wire simplex circuits accessed via the 1462 Supervision Module.

(4) Dial pulse signaling on two- and four-wire duplex circuits accessed via the 1462 Supervision Module.

(5) SF signaling on four-wire circuits accessed via the 1462 Supervision Module.

(6) E & M Signaling on circuits accessed via the 1462 Supervision Module.

Dial Control Modes

2.42 The 1433 Signal Module provides two selectable dial control modes as follows:

(a) Direct Dial—Signaling on the selected line occurs as each digit is entered into the dial pad. Digits can be entered without waiting for a previously entered digit signal to be generated.

(b) Store and Forward—Outpulsing on the selected line is inhibited until all digits have been entered into the dial pad. The entire number can then be dialed and redialed by pressing only the 1433 **SND** button. This mode is used to redial a number that was previously busy, or to repeat a called number when the connection was not completed. A telephone number of up to 12 digits can be entered in this manner.

Controls and Indicators

2.43 Controls and indicator on the 1433 front panel are shown in Figure 1-8. Callouts in the figure correspond to callouts in the following text. All pushbuttons have momentary contacts.

(1) The touch dial pad is used to generate dial pulses (DP at 10 or 20 pps and 58% break), Touch Tone (TT), and Multifrequency (MF) tones when the corresponding **DP**, **TT**, or **MF** signaling button is pressed. These signals are used for dialing on telephone lines connected to the 1422 Communication Module, and performing dialing and signal tests on circuits accessed by the 1412C Access Module and the 1462 Supervision Module. Buttons labeled **1**, **2**, **3**, and **4** in the right-hand column of the dial pad provide additional TT signaling frequencies for special applications. The **4** button at the bottom right corner of the dial pad provides Automatic Call Director (ACD) access.

(2) **HLD** indicator lights whenever a pause is encountered while the 1433 Signal Module is operating in the Store and Forward Mode.

(3) **HLD**, when momentarily pressed preceding the entry of a telephone number, places the 1433 Signal Module in the Store and Forward Mode. In this mode, the numbers are stored as they are entered, and outpulsing is prevented.

(4) **SND**, when momentarily pressed in the Store and Forward Mode, causes outpulsing of the telephone number stored in memory. Outpulsing of the number occurs each time the **SND** button is pressed. If the entered telephone number includes a pause, outpulsing of the digits following the pause must be re-initiated by again pressing the **SND** button.

(5) (6) These buttons are not functional in the 1433 Signal Module.

(7) **PSE**, when momentarily pressed, enters an access pause in a telephone number being entered into the dial pad in Store and Forward Mode. This pause will interrupt automatic outpulsing of the telephone number, to allow receipt of a secondary dial tone necessary to complete some calls. After the secondary dial tone is heard, the **SND** button is again pressed to continue outpulsing.

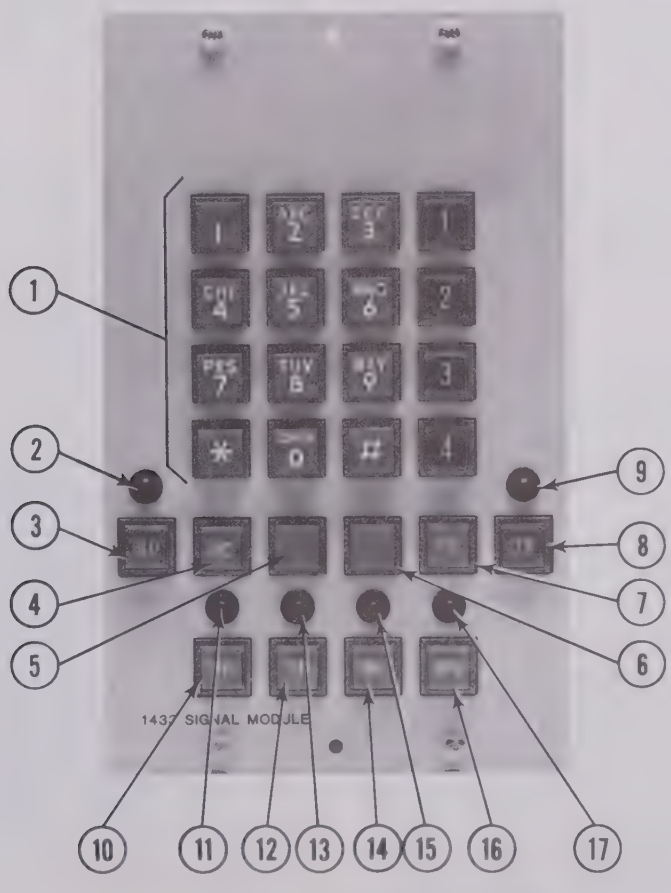

Figure 1-8. 1433 Signal Module Front Panel

(8) **CLR**, when momentarily pressed, clears the 12-digit storage register of the last telephone number entered into the dial pad. This button must always be momentarily pressed to extinguish the **CLR** indicator before entering a number into the dial pad.

(9) **CLR** indicator, when extinguished, indicates that the last telephone number entered into the dial pad has been cleared from the 12-digit storage register. This indicator must always be extinguished (**CLR** button momentarily pressed) before entering a number into the dial pad.

(10) **DP**, when momentarily pressed, enables the 1433 Signal Module to operate in the Dial Pulse signaling mode. **DP**, when momentarily pressed, also lights the **DP** indicator and extinguishes the **TT** or **MF** indicator (whichever is lit).

(11) **DP** indicator, when lit, indicates that the 1433 Signal Module is enabled to operate in the Dial Pulse signaling mode.

(12) **TT**, when momentarily pressed, enables the 1433 Signal Module to operate in the Touch Tone signaling mode. **TT**, when momentarily pressed, also lights the **TT** indicator and extinguishes the **DP** or **MF** indicator (whichever is lit).

(13) **TT** indicator, when lit, indicates that the 1433 Signal Module is enabled to operate in the Touch Tone signaling mode. The **TT** indicator is always lit (Touch Tone mode enabled) when the 1400 Test Facility is initially powered up.

(14) **MF**, when momentarily pressed, enables the 1433 Signal Module to operate in the Multifrequency (MF) signaling mode. **MF**, when momentarily pressed, also lights the **MF** indicator and extinguishes the **DP** or **TT** indicator (whichever is lit).

(15) **MF** indicator, when lit, indicates that the 1433 Signal Module is enabled to operate in the Multifrequency signaling mode.

(16) **PPS**, when successively pressed, alternately lights and extinguishes the **PPS** indicator. **PPS**, when pressed to light the **PPS** indicator, increases the rate of signaling when operating in any of the three signaling modes. **PPS**, when pressed to extinguish the **PPS** indicator, returns the signaling rate to standard. Table 1-4 shows the standard and fast signaling rates for each of the three modes.

Table 1-4
Standard and Fast Signaling Rates

SIGNAL MODE	STANDARD RATE	FAST RATE
Dial Pulse	10 pulses/second	20 pulses/second
Touch Tone	10 digits/second	12 digits/second
Multifrequency	7 digits/second	10 digits/second

(17) **PPS** indicator, when lit, indicates that the fast signaling rate has been selected by the **PPS** button. Table 1-4 shows the standard (**PPS** indicator not lit) and fast (**PPS** indicator lit) signaling rates for each of the three signaling modes.

4. 1443C VOM Module

2.44 The 1443C VOM Module, shown in Figure 1-9, provides for primary testing of two- and four-wire circuits accessed by the 1412C Access Module, or four-wire simplex circuits accessed by the 1462 Supervision Module. Primary tests which can be performed by the 1443C VOM Module are summarized in Table 1-5. The table also shows the other 1400 Test Facility modules required to perform each test.

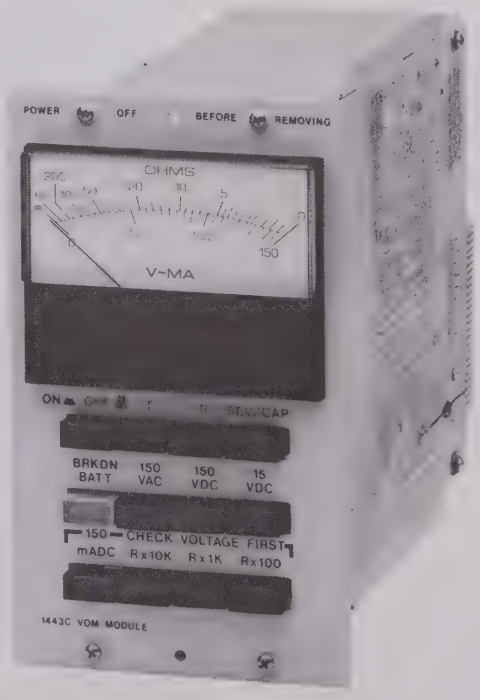

Figure 1-9. 1443C VOM Module

Table 1-5
1443C VOM Module Functions

1443 FUNCTION	OTHER MODULES REQUIRED
Two-wire and Four-wire Voltage Tests	1412C
Two-wire and Four-wire Resistance Tests	1412C
Two-wire and Four-wire Capacitive Kick Tests	1412C
Two-wire and Four-wire Breakdown	1412C
Two-wire Current Tests	1412C
Four-wire Simplex Voltage Tests	1412C and 1462
Four-wire Simplex Resistance Tests	1412C and 1462
Four-wire Simplex Capacitive Kick Tests	1412C and 1462

Voltage Measurements

2.45 AC and + or – dc voltages of up to 150 volts can be measured across accessed circuits as follows:

(a) Voltage on two-wire circuits across tip and ring, tip and ground, and ring and ground.

(b) Voltage on four-wire transmit and receive pairs across tip and ring, tip and ground, and ring and ground.

(c) Voltage on four-wire simplex circuits across simplex transmit and receive leads, transmit lead and ground, and receive lead and ground.

Resistance Measurements

2.46 Resistances can be measured across accessed circuits as follows:

(a) Resistance on two-wire circuits across tip and ring, tip and ground, and ring and ground.

(b) Resistance on four-wire transmit and receive pairs across tip and ring, tip and ground, and ring and ground.

(c) Resistance on four-wire simplex circuits across simplex transmit and receive leads, transmit lead and ground, and receive lead and ground.

Current Measurements

2.47 Dc currents of up to + or –150 mA can be measured in accessed two-wire line to drop tip and ring circuits.

Capacitive Kick Tests

2.48 Relative capacitance indications can be obtained across accessed circuits as follows:

(a) Capacitance on two-wire circuits across tip and ring, tip and ground, and ring and ground.

(b) Capacitance on four-wire transmit and receive pairs across tip and ring, tip and ground, and ring and ground.

(c) Capacitance on four-wire simplex circuits across simplex transmit and receive leads, transmit lead and ground, and receive lead and ground.

Breakdown Voltage Application

2.49 Office breakdown voltages wired to the Test Facility can be applied across accessed drop circuits as follows:

(a) Voltage application on two-wire circuits across tip and ring, tip and ground, and ring and ground.

(b) Voltage application on four-wire transmit and receive pairs across tip and ring, tip and ground, and ring and ground.

2.50 The 1443C VOM Module can be wired for either positive or negative office breakdown voltage input as described in Volume 2, Section 2, of this User Manual.

Tip and Ring Ground Reference

2.51 The 1443C VOM Module can be wired to provide tip and ring measurements and breakdown voltage application with respect to either frame or office battery ground. This option is described in Volume 2, Section 2 of this User Manual.

Controls and Indicators

2.52 Controls and indicators on the 1443C VOM Module front panel are shown in Figure 1-10. Callouts in the figure correspond to callouts in the following text. All pushbuttons except **BRKDN BATT** are of the latching type (press to activate, press to release) with colored mechanical indicators to show the pressed condition. The **BRKDN BATT** button has a momentary contact active only while the button is held pressed.

(1) The meter indicates volts, ohms, or milliamps measured during VOM tests. The lower scale of the meter reads:

(a) 150 volts full scale for 150 Vdc, 150 Vac, and **BRKDN BATT** functions.

(b) 150 milliamps full scale for the 150 mADC function.

(c) 15 volts full scale for the 15 Vdc function.

The upper scale gives a center scale reading of 1200 ohms, 12 kohms, and 120 kohms for the RX100, RX1K, and RX10K ranges respectively.

(2) **REV/CAP**, when pressed, reverses tip and ring or simplexed transmit and receive leads for dc voltage and current measurements. Pressing/releasing of this button assures upscale meter readings regardless of voltage or current polarity on the accessed circuit. **REV/CAP** also reverses connection of the ohmmeter power supply to tip and ring of the accessed circuit to allow capacitive kick tests.

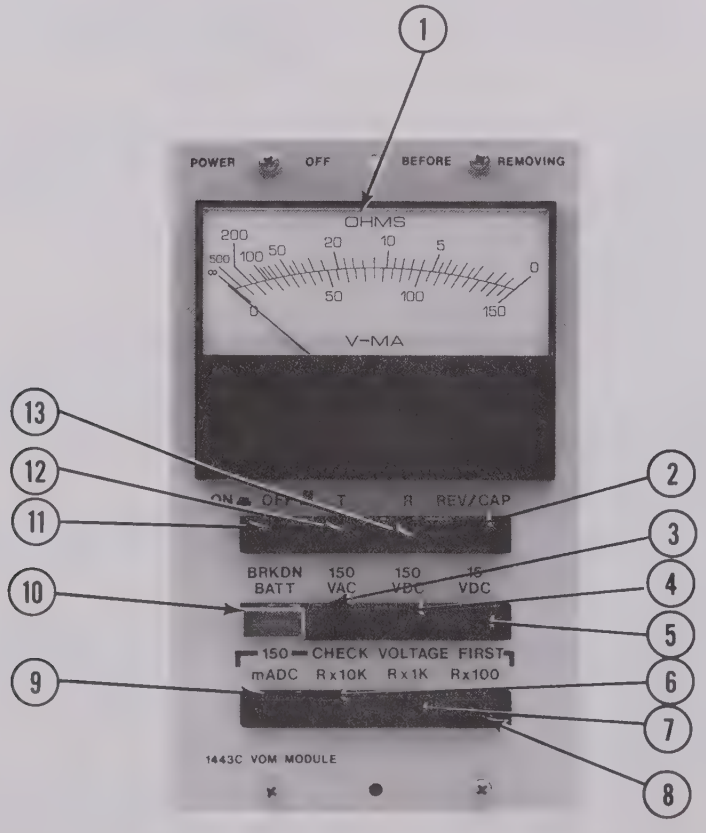

Figure 1-10. 1443C VOM Module Front Panel

(3) (4) (5) **150 VAC**, **150 VDC**, and **15 VDC**, when pressed, select the respective 150 Vac, 150 Vdc, and 15 Vdc full scale meter range. Voltages can be measured tip to ring, tip to ground, and ring to ground on two and four-wire circuit pairs, and transmit to receive lead, transmit lead to ground, and receive lead to ground on four-wire simplex circuits.

(6) (7) (8) **RX10K**, **RX1K**, and **RX100**, when pressed, select the respective 10K, 1K, and 100 times multiplier for meter resistance readings. Resistances can be measured tip to ring, tip to ground, and ring to ground on two and four-wire circuit pairs, and transmit to receive lead, transmit lead to ground, and receive lead to ground on four-wire simplex circuits.

(9) **150 mADC**, when pressed, selects the 150 mA full scale meter range for measuring current in two-wire line to drop tip and ring circuits.

(10) **BRKDN BATT**, when pressed (momentary contact), autoranges the meter circuit to 150 Vdc, and momentarily applies the office breakdown battery to an accessed two-wire circuit. Breakdown voltage can be applied tip to ring, tip to ground, or ring to ground, and voltage applied is indicated on the meter.

(11) **ON/OFF**, when pressed, connects a circuit accessed by the 1412C Access Module or the 1462 Supervision Module to primary test circuitry in the 1443C. **ON/OFF**, when released, connects the accessed circuit to an auxiliary DVOM (if one is connected to the Test Facility).

(12) (13) **T** and **R** select two or four-wire circuit pair tip or ring, or four-wire simplex circuit transmit or receive pair, for VOM testing. These buttons are mechanically interlocked, allowing only one to be pressed at a time.

Note: The four-wire simplex conditions described in the following three paragraphs (a through c) assume that the 1462 A-B REV function is not activated (**A-B REV** indicator not lit). If the 1462 **A-B REV** indicator is lit, then the word transmit must be substituted for receive in the following paragraphs, and the word receive must be substituted for transmit.

(a) When **T** and **R** are both released, voltage, resistance, breakdown, and capacitive kick tests are across tip and ring (two or four-wire circuit pair) or transmit and receive pairs (four-wire simplex circuit).

(b) When **T** is pressed and **R** is either pressed or released, voltage, resistance, breakdown, and capacitive kick tests are across tip and ground (two or four-wire circuit pair) or transmit pair and ground (four-wire simplex circuit). Measured current is in a two-wire line to drop tip circuit.

(c) When **R** is pressed and **T** is released, voltage, resistance, breakdown, and capacitive kick tests are across ring and ground (two or four-wire circuit pair) or receive pair and ground (four-wire simplex circuit). Measured current is in a two-wire line to drop ring circuit.

F. 1462 Supervision Module

2.53 The 1462 Supervision Module, shown in Figure 1-11, provides conditioning and signaling and signal testing on two-wire loop, four-wire SF, four-wire simplex, two- and four-wire duplex, and E & M circuits. Circuits are accessed through the 1462 Module under control of front panel pushbuttons on the 1412C Access Module and 1462 Supervision Module. The 1462 Supervision Module also accesses four-wire simplex circuits for primary testing at the 1443C VOM Module, and for sending of office ringing signal, talk battery, and ground start from the 1412C Module.

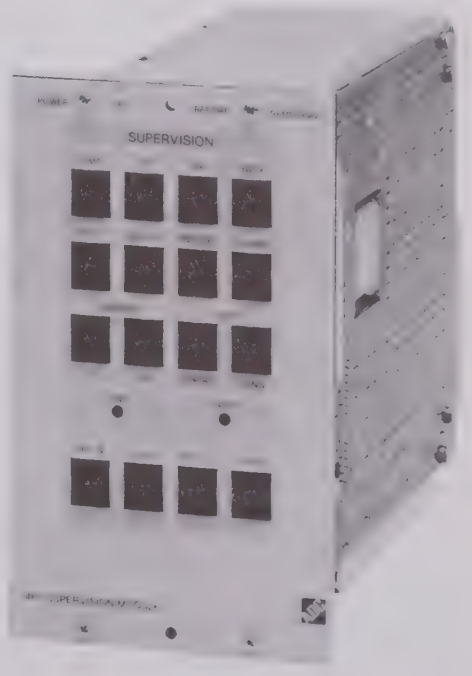

Figure 1-11. 1462 Supervision Module

2.54 All 1462 functions are summarized in Table 1-6 and described in the following paragraphs. Table 1-6 also shows the other 1400 Test Facility modules required to perform each function.

Circuit Access and Selection

2.55 Circuits to be tested or signaled by the 1462 Supervision Module are accessed by the Test Facility Cord Reel Panel or Test Access Jackfield. These cord reels and jacks are connected directly to 1462 Module input circuitry under control of 1412C and 1462 front panel pushbuttons. Pushbuttons on the 1412C Access module select and split accessed two- and four-wire circuits, while pushbuttons on the 1462 Supervision Module connect the accessed circuits to simplex or duplex coils and signaling or signal test circuitry.

Four-Wire Simplex and Two-Wire Loop/B & G Signaling

2.56 When the 1462 is in either four-wire simplex or two-wire loop mode and the accessed circuit is split by the 1412C Access Module, dial pulse contacts in the 1462 Module provide loop or B & G signaling on the accessed circuit. These dial pulse contacts are driven by signaling circuitry in the 1432 or 1433 Signal Module. Either loop or B & G mode can be selected, and B & G can be applied in either polarity across the tip and ring or simplex transmit and receive pairs. Loop circuit resistance is selectable at the front panel to provide either 150 or 600 ohms in B & G mode, or 200 or 650 ohms in loop-pulsing (normal) mode.

Two-Wire and Four-Wire Duplex Monitoring, Conditioning, and Signaling

2.57 When two-wire or four-wire duplex mode is selected, and an accessed two- or four-wire circuit is split at the 1412C Access Module, circuit duplex status is monitored by 1462 front panel indicators. The 1462 Module also provides the duplex circuitry and dial pulse contacts for conditioning and signaling on the accessed circuit. Duplex on-hook condition is normally ground potential, while off-hook is normally −48 Vdc. The dial pulse contacts are driven by signaling circuitry in the 1432 or 1433 Signal Module. Type I or Type II duplex signaling is automatically provided for the respective two- or four-wire circuit accessed. The 1462 signaling circuitry impedance can be balanced to any duplex circuit by front panel selection of either 0, 1000, or 3000 ohms or an open circuit. A frontpanel pushbutton also allows for reversal of two-wire tip and ring leads or four-wire simplex transmit and receive pairs.

Four-Wire SF Monitoring, Conditioning, and Signaling

Note: The four-wire SF function is available only if an SF circuit card was installed in the 1462 before shipment from the factory. This SF function must be specified at the time of Test Facility order.

2.58 When SF mode is selected, and an accessed four-wire circuit is split at the 1412C Access Module, circuit SF status is monitored by 1462 front panel indicators. The 1462 Module also provides the SF signal output for conditioning and signaling on the accessed circuit, as driven by the 1432 or 1433 Signal Module. SF 2600 Hz tones are transmitted and detected at levels selected

Table 1-6
1462 Supervision Module Functions

1462 FUNCTION	OTHER MODULES REQUIRED
Four-wire Simplex and Two-wire Loop/B & G Signaling	1412C and 1432 or 1433
Two-wire and Four-wire Duplex Monitoring, Conditioning, and Signaling	1412C and 1432 or 1433
Four-wire SF Monitoring, Conditioning and Signaling	1412C and 1432 or 1433
E & M Monitoring, Conditioning, and Signaling	1412C and 1432 or 1433
Four-wire Simplex and Two-wire Signal Tests	1412C and Auxiliary Signal Test Unit
E & M Signal Tests	1412C and Auxiliary Signal Test Unit
Four-wire Simplex, Send Office Ringing Signal	1412C
Four-wire Simplex, Send Talk Battery	1412C
Four-wire Simplex, Send Ground Start	1412C
Four-wire Simplex Primary (VOM) Tests	1412C and 1443C or Auxiliary DVOM

and set in the Calibration Section when a model 8972 4W Level TMS Module is incorporated into the 1412C Module. Without the 8972 Module, factory set levels are furnished for 1412C Modules with 0/0 dBm and +7/−16 dBm level coordination.

E & M Monitoring, Conditioning, and Signaling

2.59 When E & M mode is selected, the Line E and Drop M leads of an accessed E & M circuit are monitored by 1462 front panel indicators. After the circuit is split by the 1462 E & M **SPLIT** button, E & M conditioning and signaling can be sent on the Line M or Drop E lead. The 1462 Module can be programmed before shipment or in the office to provide any of the E & M conditions shown in Table 1-7. Two complete sets of on-hook, off-hook, and monitor conditions can be programmed, and either of these two sets can then be selected during operation by front panel pushbuttons. In addition, the 1462 Module can be programmed to automatically provide Type I E & M conditioning when E & M mode is first selected (prior to selecting a different type). This gives three possible E & M types selectable at the front panel. E & M programming procedures are described in the Installation Section of Volume 2 of this user manual.

Four-Wire Simplex and Two-Wire Loop Signal Tests

2.60 Accessed four-wire simplex and two-wire loop circuits can be connected, through the 1462 Supervision Module, to an auxiliary signal test set hardwired or patched to the 1400 Test Facility. After the circuit is split by the 1412C Access Module, send and measure tests can be performed as provided by the signal test set.

E & M Signal Tests

2.61 Accessed E & M circuits can be connected, through the 1462 Supervision Module, to an auxiliary signal test set hardwired or patched to the Test Facility. After the circuit is split, Line E and Drop M pulses can be measured at the signal test set. Types of measurement that can be performed depend upon the capabilities of the signal test set used.

Four-Wire Simplex Ringing Signal

2.62 When four-wire Simplex mode is selected, and an accessed four-wire circuit is split at the 1412C Access Module, office ringing signal can be applied across the simplex transmit and receive pairs. The office ringing signal must be hardwired to the Test Facility, and is applied under control of the 1412C Module.

Four-Wire Simplex Talk Battery

2.63 When four-wire Simplex mode is selected, and an accessed four-wire circuit is split at the 1412C Access Module, Test Facility talk battery can be applied across the simplex transmit and receive pairs. Talk battery polarity and application are controlled at the 1412C Module.

Table 1-7
1462 E & M Programming Conditions

	SEND		MONITOR	
E & M LEAD	ON HOOK	OFF HOOK	ON HOOK	OFF HOOK
Drop E	Open	Ground		
Line M	Open Ground	Ground −48 Vdc +12 Vdc Ext. Batt.		
Line E			Open/−48 Vdc Open/+12 Vdc	Ground
Drop M			Ground Open/−48 Vdc Open/+12 Vdc Open/Ext. Batt. *	Ground Open/+12 Vdc Open/−48 Vdc *

*Automatically follow respective Line M settings.

Four-Wire Simplex Ground Start

2.64 When four-wire Simplex mode is selected, and an accessed four-wire circuit is split at the 1412C Access Module, a PBX trunk can be seized by applying a ground to the simplex transmit or receive pair. Ground start application is controlled at the 1412C Module.

Four-Wire Simplex Primary (VOM) Tests

2.65 When four-wire Simplex mode is selected, primary (VOM) tests can be performed on the simplex transmit and receive pairs. Tests are performed at the 1443C VOM Module or an auxiliary DVOM hardwired or patched to the Test Facility.

Controls and Indicators

2.66 Controls and indicators on the 1462 Supervision Module front panel are shown in Figure 1-12. Callouts in the figure correspond to callouts in the following text. All buttons are of the touch type which activate logic circuitry within the module to select the various functions. An indicator above each button lights to show the selected function. A button is pressed once to select a function (indicator lit) and pressed again to release the function (indicator not lit). Many interacting functions also set and/or clear each other.

(1) (2) (3) (4) **SUPERVISION** buttons select E & M, SF, DX, or 4W SX mode for conditioning and signaling on an accessed circuit. Only one mode selection will be recognized at a time, since pressing any button to select a mode will automatically clear any other button previously pressed. If none of these four modes is selected, the 1462 is automatically in two-wire loop mode.

(1) **E & M** when pressed, selects the 1462 E & M mode, and connects the accessed E & M circuit Line E and Drop M leads to the respective 1462 **LINE** and **DROP** indicators. After the E & M circuit is split (1462 **SPLIT** button pressed), conditioning and signaling circuitry is connected to the E & M Line M and Drop E leads. E & M on-hook, off-hook, and signaling can then be sent on the circuit as controlled by the 1462 **LINE** and **DROP OFF HK** and **PULSE** buttons.

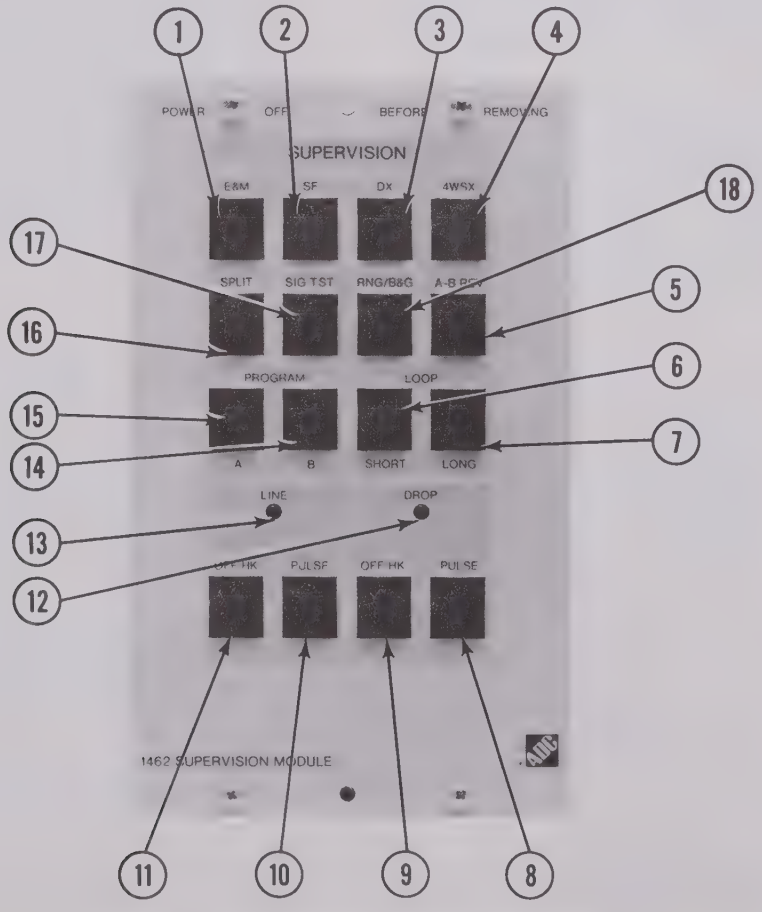

Figure 1-12. 1462 Supervision Module Front Panel

(2) **SF**, when pressed, selects the 1462 SF mode, and connects an accessed four-wire circuit to SF supervision and signaling circuitry in the 1462 Module. The SF circuitry is connected to the four-wire circuit through appropriate level conditioning circuitry for application to the line transmit or drop receive pair.

Note: This button is functional only if the optional SF capability is provided with the 1462 Supervision Module (1462B), and a four-wire circuit has been selected at the 1412C Access Module.

(3) **DX**, when pressed, selects the 1462 Duplex mode. Duplex supervision and signaling circuitry is connected to an accessed two- or four-wire circuit (when split by the 1412C Access Module) through appropriate duplexing coils. Circuit status is then indicated by the 1462 **LINE** and **DROP** indicators, and duplex conditioning and signaling can be sent as controlled by the **LINE** and **DROP OFF HK** and **PULSE** buttons.

(4) **4W SX**, when pressed, selects the 1462 Four-Wire Simplex mode, and connects center-tapped simplex coils across the transmit and receive pairs of an accessed four-wire circuit. Loop/B & G signaling, talk battery, office ringing signal, and ground start can then be sent on this simplexed four-wire circuit. VOM and signal tests can also be performed on the simplexed circuit.

(5) **A-B REV**, when pressed, interchanges the tip and ring leads of an accessed two-wire circuit, or the simplex transmit (A) and receive (B) pairs of a simplexed four-wire circuit. This function can be performed on two-wire loop circuits, two and four-wire duplex circuits, and four-wire simplex circuits.

(6)(7) **SHORT** and **LONG LOOP** buttons provide selectable loop off-normal resistances and duplex balance impedances as follows:

(a) Two-wire loop or four-wire simplex mode without B & G:

(1) **SHORT LOOP**, when pressed, adds 450 ohms to the normal 200 ohms presented to the loop during dialing (650 ohms total).

(2) **LONG LOOP**, when pressed, clears the **SHORT LOOP** function to return loop resistance to 200 ohms.

(b) Two-wire loop or four-wire simplex loop mode with B & G:

(1) **SHORT LOOP**, when pressed, adds 450 ohms to the 150 ohms normally in each of the signal leads (600 ohms total).

(2) **LONG LOOP**, when pressed, clears the **SHORT LOOP** function to return the resistance in each signal lead to 150 ohms.

(c) Duplex mode:

(1) **SHORT LOOP** and **LONG LOOP** both pressed—present a balance for a 0 ohm loop.

(2) **SHORT LOOP** only pressed—presents a balance for a 1000 ohm loop.

(3) **LONG LOOP** only pressed—presents a balance for a 3000 ohm loop.

(4) Neither **SHORT** nor **LONG LOOP** pressed—present an open balance network (for certain electronic duplex circuits).

(8)(9) **DROP PULSE** and **OFF HK** provide SF, E & M, and DX conditioning and signaling on the drop side of an accessed and split circuit.

(8) **DROP PULSE**, when pressed, enables dialing by means of the 1432 or 1433 Signal Module. This button is functional only if all 1422 Communication Module telephone lines are either released or placed on hold.

(9) **DROP OFF HK**, when released, provides drop on-hook conditioning, and when pressed, provides drop off-hook conditioning.

(10)(11) **LINE PULSE** and **OFF HK** provide SF, E & M, and DX conditioning and signaling on the line side of an accessed and split circuit.

(10) **LINE PULSE**, when pressed, enables dialing by means of the 1432 or 1433 Signal Module. This button is functional only if all 1422 Communication Module telephone lines are either released or placed on hold.

(11) **LINE OFF HK**, when released, provides line on-hook conditioning, and when pressed, provides line off-hook conditioning.

(12)(13) **DROP** and **LINE** indicators monitor conditioning and dialing on the respective line and drop side of an accessed E & M, SF, or DX circuit as follows:

(a) Indicator lit — circuit is on-hook (idle)

(b) Indicator not lit — circuit is off-hook (busy)

(c) Indicator flashing — circuit is dialing

The circuit must be split at the 1412C Access Module for DX circuit monitoring, but may or may not be split for SF or E & M circuits. Status is indicated in both directions.

(14) (15) **PGM B** and **PGM A** buttons select the type of E & M conditioning and signaling to be sent by the 1462 Module. E & M types selectable are programmed into the module during Test Facility installation (refer to the Installation Section of Volume 2 of this manual). Each of the **PGM** buttons selects one of the two E & M types. If neither button is pressed (in E & M mode), either Type I E & M will be enabled, or E & M mode will not be functional, again as determined during installation programming.

(16) **SPLIT**, when pressed, splits an accessed E & M circuit, and connects the Line M and Drop E leads to E & M conditioning and signaling circuitry in the 1462 Module. Off-hook, on-hook, and signaling can then be sent on either lead as controlled by the 1462 **LINE** and **DROP OFF HK** and **PULSE** buttons.

(17) **SIG TST**, when pressed, connects an accessed two-wire or simplexed four-wire circuit to an auxiliary signal test set hardwired or patched to the Test Facility. The accessed circuit must be split at the 1412C Access Module. Types of tests that can be performed depend upon the capabilities of the signal test set used.

(18) **RNG-B & G**, when pressed in two-wire loop or four-wire simplex mode, enables battery and ground pulsing on the accessed two-wire loop or four-wire simplex circuit. Pulsing is normally battery/open on the tip or transmit pair and ground/open on the ring or receive pair; however this can be reversed by pressing the 1462 **A-B REV** button.

RNG-B & G, when pressed in DX, E & M, or SF mode, applies a continuous 20 pps ringing signal to the line or drop side of the accessed DX, E & M, or SF circuit as long as the button is held pressed. This function requires the corresponding 1462 **LINE** or **DROP PULSE** function activated (**LINE** or **DROP PULSE** indicator lit).

G. Cord Reel Panel

2.67 The Cord Reel Panel provides cord reel access to two-, four-, and six-wire circuits for test and communication functions at the 1400 Test Facility. Various types of Cord Reel Panels are available with the Test Facility, including panels with 310 Longframe cords or Bantam cords only, and combination panels with both 310 Longframe and Bantam cords. A typical 310 Longframe Cord Reel Panel is shown in Figure 1-13. Other panels available with the Test Facility are listed and described in the J Drawing Section of Volume 2 of this user manual.

H. Test Access Jackfield

2.68 The Test Access Jackfield provides patch cord access to two-, four-, and six-wire circuits for test and communication functions at the 1400 Test Facility. Various types of jackfields are available with the Test Facility, including jackfields with 310 Longframe or Bantam jacks only, and combination jackfields with both 310 Longframe and Bantam jacks. A typical 310 Longframe jackfield is shown in Figure 1-14. Other jackfields available with the Test Facility are listed and described in the J Drawing Section of Volume 2 of this user manual.

Figure 1-13. Typical 1400 Test Facility Cord Reel Panel

Figure 1-14. Typical 1400 Test Facility Test Access Jackfield

3. SYSTEM SPECIFICATIONS

1402 SHELF WITH FOUR MODULES

A. Physical

Dimensions

Height: 7.0 in (17.8 cm)

Width: 19.0 in (48.3 cm)

Depth: 11.2 in (28.5 cm)

Weight: 36 lbs (16.4 kg) to 46 lbs (20.9 kg)

B. Environmental

Shipping and Storage Temperature: -40 °C (-40 °F) to +70 °C (+168 °F).

Operating Temperature: +15 °C (+59 °F) to +50 °C (+112 °F).

Shipping and Storage/Operating Relative Humidity: 5% to 95% without condensation.

C. Power: -48 Vdc, fused or breakered at office distribution panel for 1.0 Amp.

1403 SHELF WITH FIVE MODULES

A. Physical

Dimensions

Height: 7.0 in (17.8 cm)

Width: 23.0 in (58.4 cm)

Depth: 11.2 in (28.5 cm)

Weight: 45 lbs (20.5 kg) to 55 lbs (25.0 kg)

B. Environmental

Shipping and Storage Temperature: -40 °C (-40 °F) to +70 °C (+168 °F).

Operating Temperature: +15 °C (+59 °F) to +50 °C (+112 °F).

Shipping and Storage/Operating Relative Humidity: 5% to 95% without condensation.

C. Power: -48 Vdc, fused or breakered at office distribution panel for 1.0 Amp.

EACH TEST FACILITY MODULE (1412C, 1422, 1432, 1433, 1443C, and 1462)

A. Physical

Dimensions

Height: 7.0 in (17.8 cm)

Width: 4.25 in (10.8 cm)

Depth: 9.5 in (24.1 cm)

Weight: Less that 2.5 lbs (1.1 kg)

B. Environmental

Shipping and Storage Temperature: -40 °C (-40 °F) to +70 °C (+168 °F).

Operating Temperature: +15 °C (+59 °F) to +50 °C (+112 °F).

Shipping and Storage/Operating Relative Humidity: 5% to 95% without condensation.

C. Power:

1461 and 1462—less than 350 mA.
All others—less than 90 mA.

1432 AND 1433 SIGNAL MODULE OPERATIONAL SPECIFICATIONS

A. Pulse Dialing

Pulse Rate

Standard: 10 pps

Fast: 20 pps

Interdigit Pause

At 10 pps: 800 msec

At 20 pps: 400 msec

Make/Break Ratio: 40/60

B. Touch Tone Signaling

Frequencies:

DIAL PAD BUTTON	F_1 (Hz)	F_2 (Hz)
1	697	1209
2	697	1336
3	697	1477
4	770	1209
5	770	1336
6	770	1477
7	852	1209
8	852	1336
9	852	1477
0	941	1336
(*)	941	1209
(#)	941	1477
(1)	697	1633
(2)	770	1633
(3)	852	1633
(4)	941	1633

Frequency Accuracy: ±0.3%

Output Levels

High Frequency (F_2) Group: -3 ±1 dBm

Low Frequency (F_1) Group: -6 ±1 dBm

Nominal Total: -1.3 dBm

Nominal High Group Emphasis: +2.9 dBm

Output Loading: 100 ohms minimum

Pulse Rate

Normal: 10 pps ±2%

Fast: 12 pps ±2%

C. Multifrequency Dialing

Frequencies:

DIAL PAD BUTTON	F_1 (Hz)	F_2 (Hz)
1	700	900
2	700	1100
3	900	1100
4	700	1300
5	900	1300
6	1100	1300
7	700	1500
8	900	1500
9	1100	1500
0	1300	1500
KP (*)	1100	1700
ST (#)	1500	1700
Code 11(1)	700	1700
KP-2(2)	1300	1700
KP-1(3)	1100	1700
Code 12(4)	900	1700

Frequency Accuracy: ±0.5%

Output Level per Group: -6 dBm

Pulse Rate

Normal: 7 pps ±2.0%

Fast: 10 pps ±2.0%

Duty Cycle: 50%

1462 SUPERVISION MODULE OPERATIONAL SPECIFICATIONS

A. E & M Circuit

M-Line Output (when split)

On-hook: Open or Ground (selectable)

Off-hook: Ground, -48 Vdc, +12 Vdc, or External Battery (selectable).

Switching: ±75 Volts maximum
1.0 Amps maximum
30 VA maximum

Pulse Rate and Break: Determined by 1432/1433 Signal Module.

Ringing: 20 pps nominal

E-Drop Output

On-hook: Open

Off-hook: Ground

Switching: ±75 Volts maximum
1.0 Amps maximum
30 VA maximum

Pulse Rate and Break: Determined by 1432/1433 Signal Module.

Ringing: 20 pps nominal

M-Drop Monitor

Impedance, Bridged: 45 kohms ±10%

Impedance, Split: 2 kohms ±10%

Impedance Return: To ground for ungrounded conditions; To selected supply for grounded conditions.

Monitor Threshold: One-third of selected supply ±10%.

E-Line Monitor

Impedance, Bridged: 45 kohms ±10%

Impedance, Split: 2 kohms ±10%

Impedance Return: -48 Vdc or +12 Vdc (selectable)

Monitor Threshold: One-third of selected supply ±10%

B. SF Circuit

Output Impedance: Greater than 10 kohms

Tone on to Tone Off "Burst" Level: +12 dB ±1 dB with respect to adjustable output

Duration of "Burst": 250 ms ±50 ms

Longitudinal Balance: Greater than -60 dB at 60 Hz

Maximum Signal Input: +10 dBm 300 to 3400 Hz unclipped

SF Frequency Detection

Capture: Less than 100 Hz either side of 2600 Hz. (SF detect threshold set at -26 dBm, SF input level set at -10 dBm)

Release: Greater than 110 Hz, less than 800 Hz either side of 2600 Hz (SF input level set at -20 dBm)

SF Detection Thresholds: -47 dBm to -19 dBm adjustable ("R" potentiometer factory set as follows):

RCV Line	R5	-31 dBm
	R12	-31 dBm
	R19	-31 dBm
	R25	-24 dBm
XMT Drop	R2	-31 dBm
	R8	-31 dBm
	R15	-31 dBm
	R23	-47 dBm

SF Output Levels: -40 dBm to -10 dBm adjustable ("R" potentiometers factory set as follows):

XMT Line	R3	-20 dBm
	R9	-20 dBm
	R16	-20 dBm
	R24	-36 dBm
RCV Drop	R6	-20 dBm
	R13	-20 dBm
	R20	-20 dBm
	R26	-13 dBm

Output Distortion: Less than 1%

SF Output Frequency: 2600 Hz ±3 Hz

Ringing: 20 pps nominal

C. DX Circuits

Configuration: Standard with Type I or II automatically selected.

19.2 Volt Supply

Voltage: 0.4 of external -48 Vdc ±2 Vdc

Source Impedance: 240 ohms nominal

Signaling

On-Hook: Ground

Off-Hook: -48 Vdc office battery

Source Impedance: 240 ohms nominal

Relay: Simulated electronically

Pulse Rate and Break: Determined by 1432/1433 Signal Module.

Ringing: 20 pps nominal

Balance Network: 0, 1000, or 3000 ohms, or open circuit.

Four-Wire Simplex Coils

Impedance: 12 kohms minimum at 1 kHz
1000 ohms dc maximum tip to ring

Application: Automatic when four-wire circuit is selected at 1412C.

Monitors: Indicate status of split circuits only

A & B Leads: Reversible

D. Loop and 4W SX Circuits

Loop Pulsing

Off-Normal Resistance: 200 or 650 ohms ±10% (selectable).

Pulse Rate and Break: Determined by 1432/1433 Signal Module.

B & G Pulsing

Off-Normal Resistance: 150 or 600 ohms ±10% (selectable).

Polarity: Standard tip to battery, ring to ground (reversible).

Pulse Rate and Break: Determined by 1432/1433 Signal Module.

Four-Wire Simplex Coils

Impedance: 12 kohms minimum at 1 kHz
100 ohms dc maximum tip to ring

A & B Leads: Reversible

E. Signal Test

Loop Mode

Connections: Direct to A & B leads

Terminations: None

Pulse Test: Incoming and outgoing pulses

Other Modes

Pulse Conversion for Measurement: To Type I E & M with Battery/Open of M-Lead.

SF Distortion: ±3%

DX and E & M Distortion: ±1%

SECTION 2
OPERATION

CONTENTS PAGE

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2. PROCEDURE DESCRIPTION 2-1
3. TEST FACILITY PREPARATION 2-1
4. PROBLEMS 2-1
PROCEDURES 2-4

1. GENERAL

1.01 This section presents detailed step-by-step procedures for operating the 1400 Test Facility. The procedures which can be performed are dependent upon the functional modules included in the Test Facility.

2. PROCEDURE DESCRIPTION

2.01 Each 1400 Test Facility procedure includes:

(a) A brief description of the procedure and its purpose.

(b) An illustration of Test Facility modules required for the procedure, with pertinent front panel controls and indicators highlighted.

(c) A very general schematic diagram of Test Facility circuitry used in the procedure.

Note: These diagrams show only those switches and relay contacts directly involved in the procedure. They do not show relay control circuitry, or normally closed contacts which are in the circuit but not an active part of the procedure. Troubleshooting should NOT be attempted from these diagrams.

(d) Step-by-step procedures.

3. TEST FACILITY PREPARATION

3.01 The following 1400 Test Facility conditions must be set up prior to performance of each operating procedure:

(a) All cord reels and patch cords disconnected.

(b) **POWER** button pressed (**POWER** indicator lit) on the 1412C Access Module.

(c) **SPEAKER** control on the 1412C Access Module rotated counterclockwise into the detent (OFF) position.

(d) **DP** indicator lit on the 1432/1433 Signal Module. Press the **DP** button if necessary to light the indicator.

(e) **PPS** indicator not lit on the 1432/1433 Signal Module. Press the **PPS** button if necessary to extinguish the indicator.

(f) **CLR** button pressed at least once on the 1432/1433 Signal Module.

(g) No indicators lit on the 1462 Supervision Module.

3.02 If a series of procedures is to be performed on one accessed circuit, these Test Facility conditions must be set up prior to each individual procedure in the group.

4. PROBLEMS

4.01 All problems encountered during performance of any operating procedure should be referred to Volume 3 of this User Manual. If problems cannot be resolved, contact ADC Telecommunications as described in Section 5 of Volume 3.

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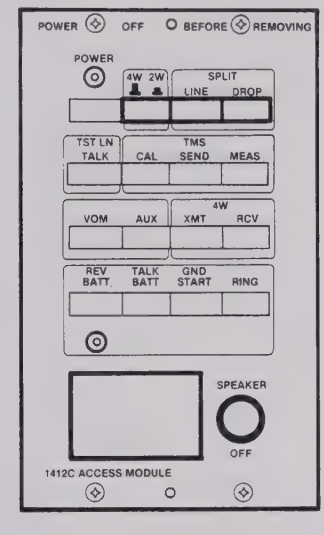
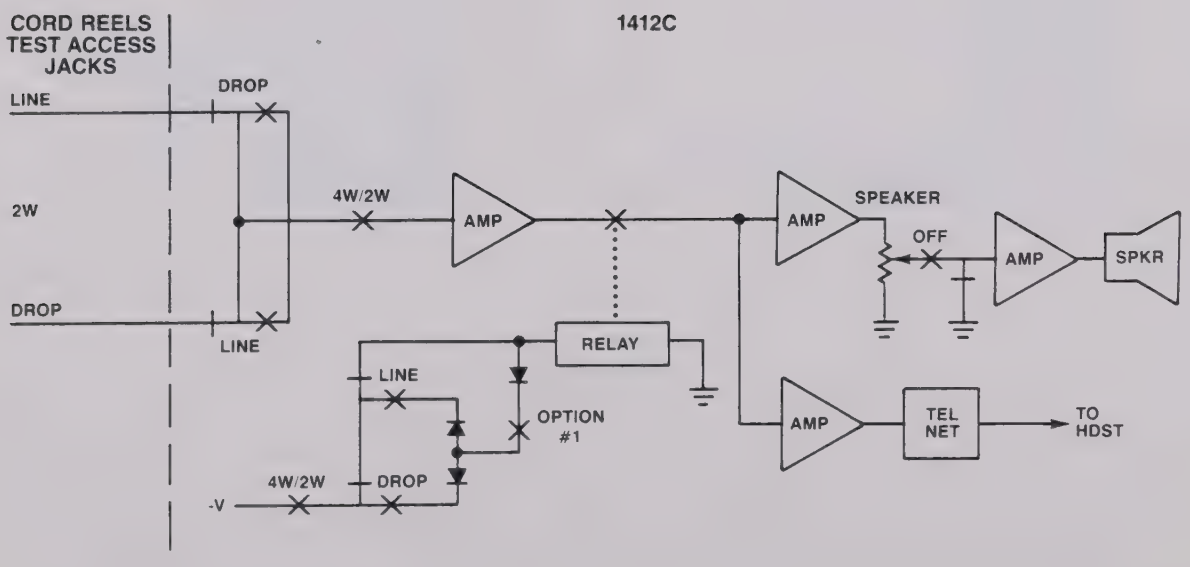
PROCEDURE 1
TWO WIRE MONITOR—BRIDGED/TERMINATED

This procedure is used to monitor a two-wire circuit to determine, prior to testing, whether it is idle or busy. The procedure provides bridged or terminated monitoring either via headset, or via the speaker in the 1412C Access Module.

Note: For terminated circuit monitoring, the 1412C Access Module must include Option 1. Inclusion or exclusion of this option was pre-set at the time of installation (see Volume 2, Section 2 of this User Manual).

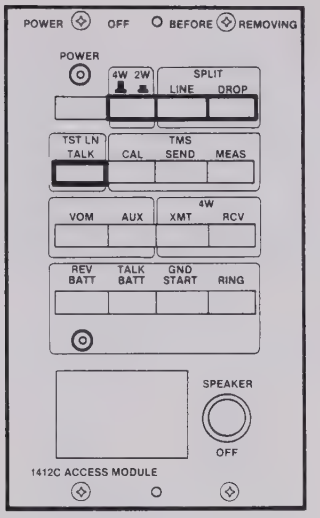


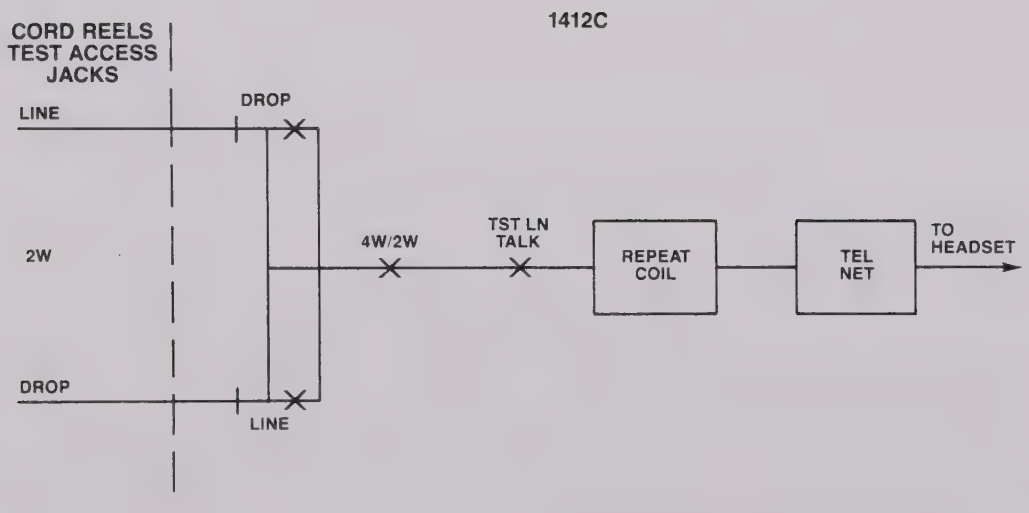


STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be monitored. *Note:* To avoid interruption of service if the circuit is in use, the **LINE** and **DROP** connections must be made to the respective access jacks simultaneously. If double-ended patch cords are used, they must be plugged into the Test Facility jackfield first, then into the access jacks.
2	Press the 1412C **4W/2W** button.
3	Monitor via headset or speaker as follows: (a) Headset—Listen on the headset plugged into the Test Facility headset jacks. (b) Speaker—Rotate the 1412C **SPEAKER** control clockwise out of detent position, and adjust for desired speaker volume.
4	If the 1412C Access Module includes Option #1, split the circuit to line or drop (if desired) by pressing the respective 1412C **LINE** or **DROP SPLIT** button.
5	Monitor as described in Step 3

PROCEDURE 2
TWO WIRE TALK—TERMINATED

This procedure is used to talk on either the line or drop side of a split two-wire circuit.

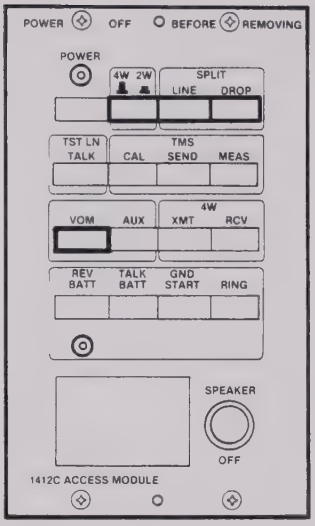


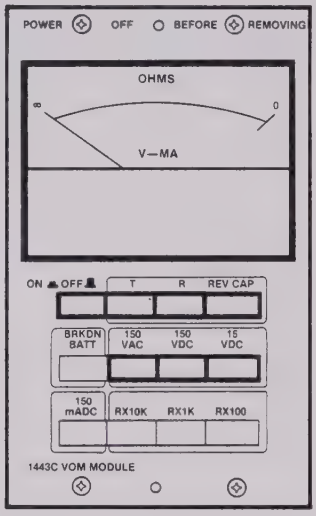


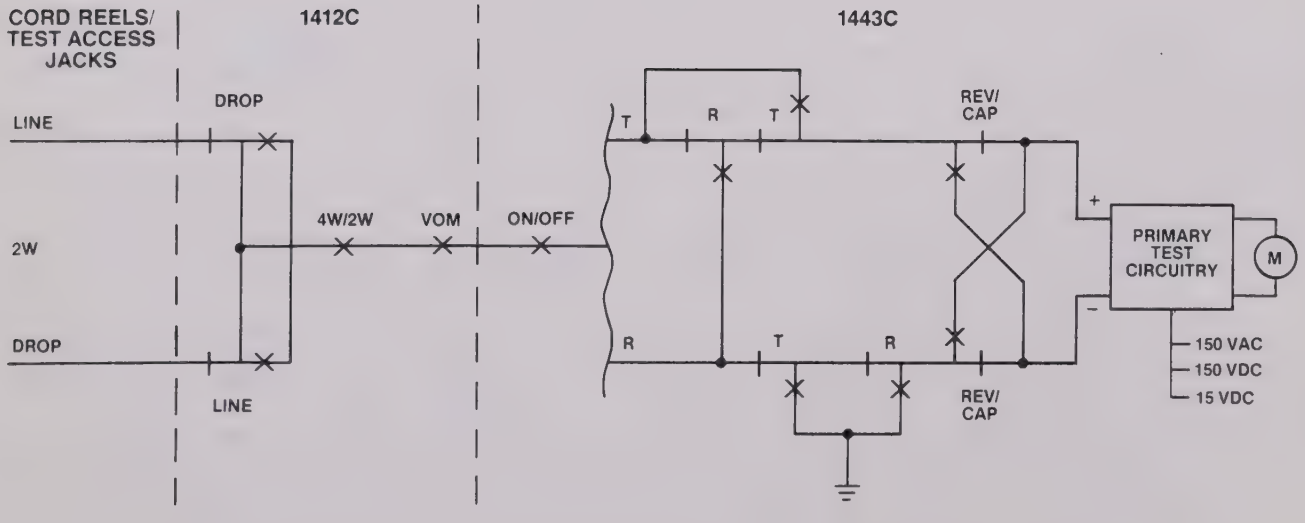
STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit over which talking will take place.
2	Press the 1412C **4W/2W** button, and ensure accessed circuit is idle (see Procedure 1 if necessary).
3	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which talking is to take place.
4	Press the 1412C **TST LN TALK** button.
5	Talk on the circuit using a headset plugged into the Test Facility headset jacks.

PROCEDURE 3
TWO WIRE VOM TEST—VOLTAGE MEASUREMENT

This procedure is used to measure ac or dc voltage on a split two-wire circuit. Voltages of up to 150 Vac and dc can be measured between tip and ring, tip and ground, or ring and ground. Either polarity dc can be measured.







STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
3	Press the 1412C **VOM** button.
4	Press the 1443C **150 VAC** or **150 VDC** button as desired.
5	Press the 1443C **T** or **R** button to select tip to ground or ring to ground measurement respectively. If neither button is pressed, measurement will be across tip and ring.
6	Refer to the following table for dc polarity that will cause upscale meter readings for different combinations of 1443C **T**, **R**, and **REV/CAP** buttons. Press or release the **REV/CAP** button accordingly. *Note:* The 1443C **REV/CAP** button has no effect on ac voltage readings.

T	R	REV/CAP PRESSED	REV/CAP RELEASED
Pressed	Released	Tip Negative wrt Ground	Tip Positive wrt Ground
Released	Pressed	Ring Positive wrt Ground	Ring Negative wrt Ground
Released	Released	Ring Positive wrt Tip	Tip Positive wrt Ring

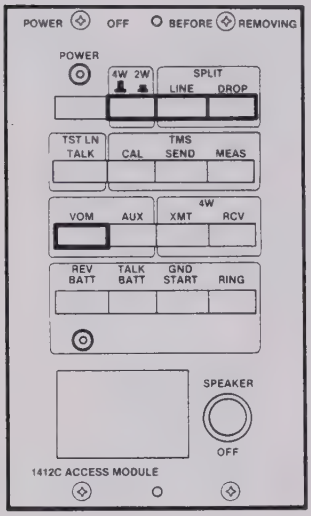
wrt = with respect to

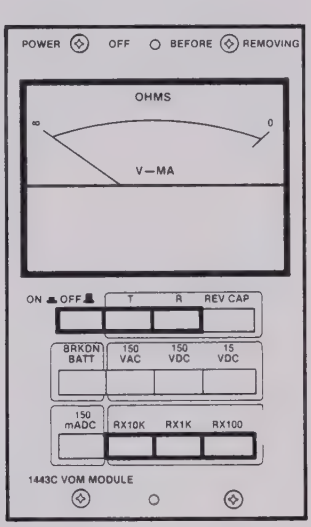
Caution: If the 1443C meter deflects to the left in the following procedure, immediately press or release the **REV/CAP** *button.*

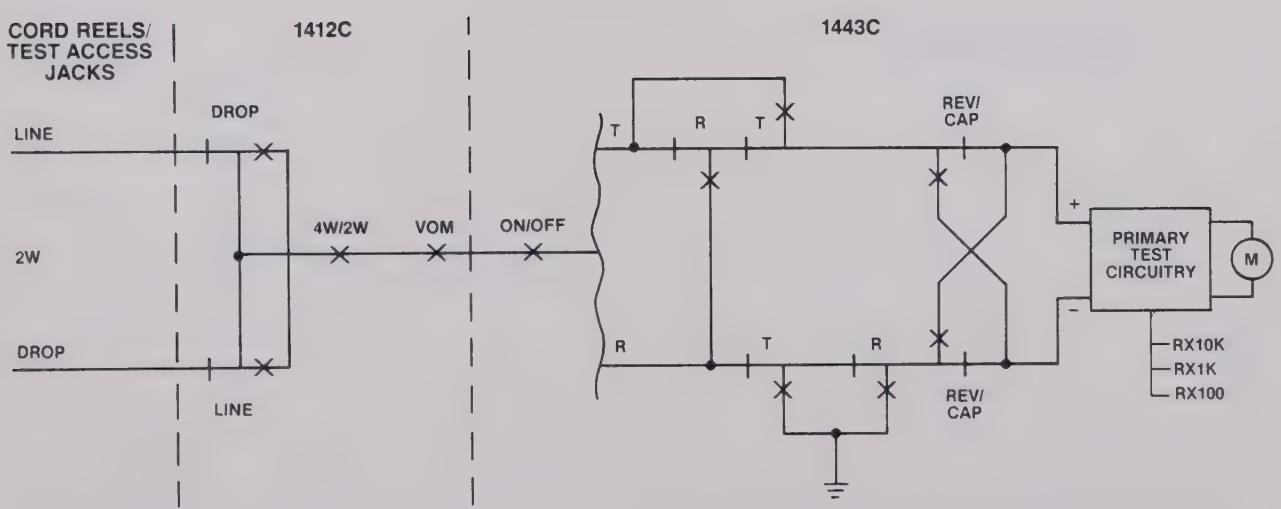
7	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed.
8	Press the 1443C **ON/OFF** button.
9	Read the voltage on the 1443C meter. If voltage is less than 15 Vdc, release the 1443C **150 VDC** button, and press the **15 VDC** button.

PROCEDURE 4
TWO WIRE VOM TEST—RESISTANCE MEASUREMENT

This procedure is used to measure dc resistance of a two-wire circuit. Resistance can be measured between tip and ground, tip and ring, or ring and ground.



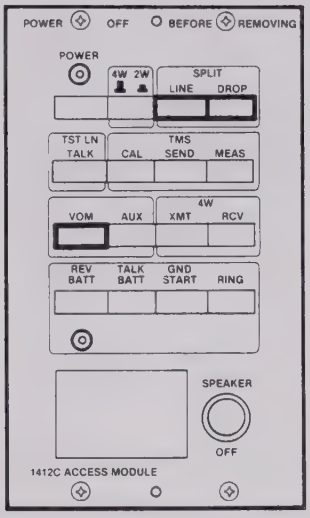


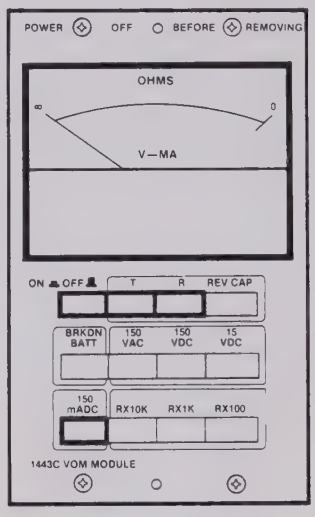


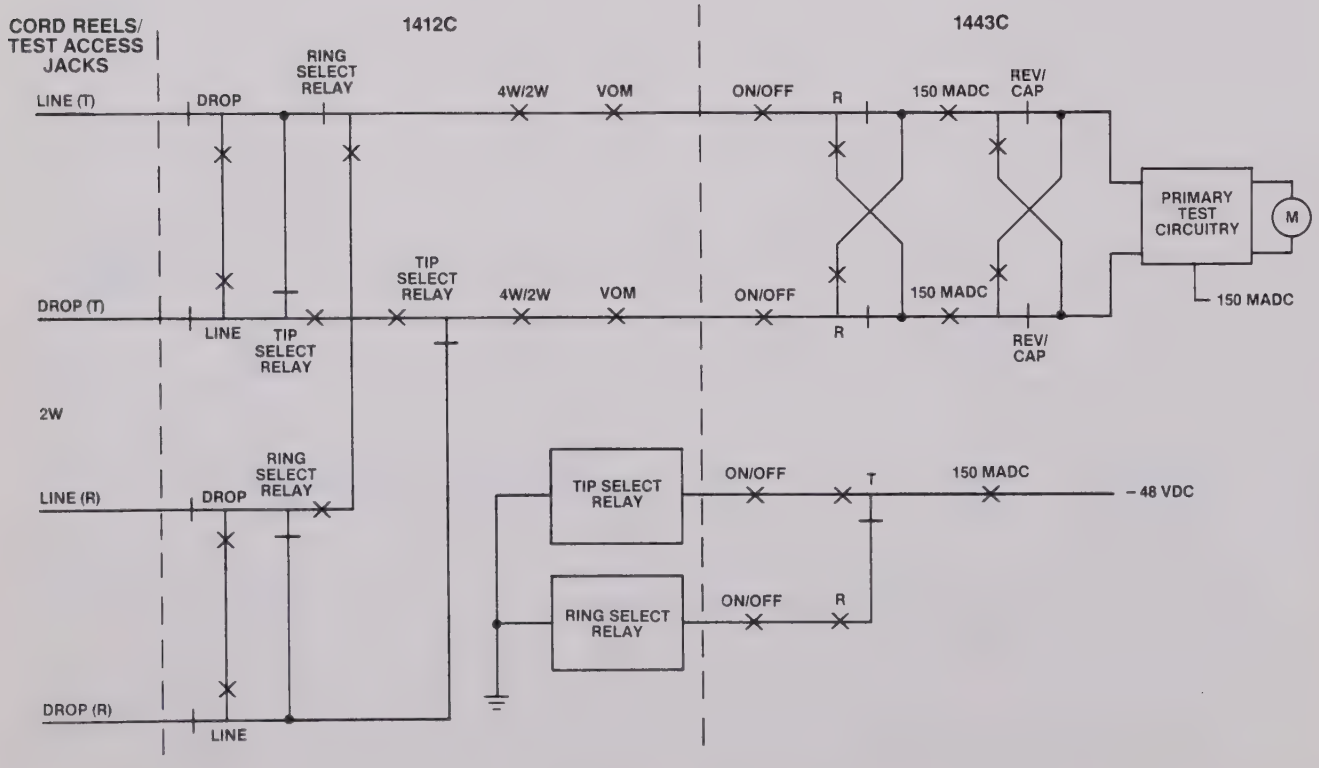
STEP	PROCEDURE
1	Perform Procedure 3 "Two Wire VOM Test—Voltage Measurement" for both ac and dc voltage, and for tip/ring circuit to be selected below. *Caution: If any ac or dc voltage is measured, DO NOT continue with resistance measurements.*
2	Release all 1443C buttons.
3	Press the 1443C **RX10K**, **RX1K**, or **RX100** button to select the desired resistance range.
4	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed (may already be pressed).
5	Press the 1443C **T** or **R** button to select tip to ground or ring to ground measurement respectively. If neither button is pressed, measurement will be across tip and ring.
6	Press the 1443C **ON/OFF** button.
7	Observe resistance reading on the 1443C meter.

PROCEDURE 5
TWO WIRE VOM TEST—CURRENT MEASUREMENT

This procedure is used to measure dc current in the tip and ring leads of a continuous two-wire circuit or tip-to-ring current in a split two-wire circuit. Current of up to 150 mA can be measured.







STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
3	Press the 1412C **VOM** button.
4	Press the 1443C **150 MA DC** button.
5	Refer to the following table for dc polarity that will cause upscale meter readings for different combinations of 1443C **T**, **R**, and **REV/CAP** buttons. Press or release the **REV/CAP** button accordingly.

T	R	REV/CAP RELEASED	REV/CAP PRESSED
Pressed	Released	Line Tip Positive wrt Drop Tip	Line Tip Negative wrt Drop Tip
Released	Pressed	Line Ring Negative wrt Drop Ring	Line Ring Positive wrt Drop Ring
Released	Released	Tip Positive wrt Ring (Circuit Split)	Tip Negative wrt Ring (Circuit Split)

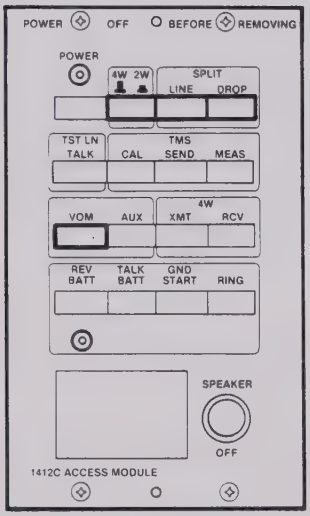
wrt = with respect to

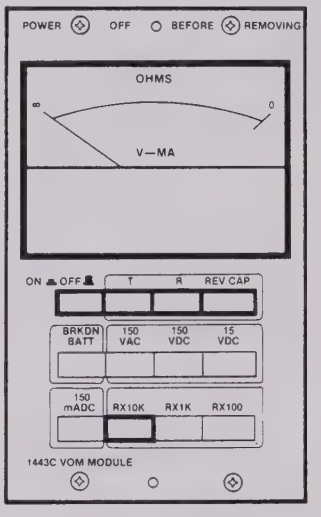
Caution: If the 1443C meter deflects to the left in any of the following steps, immediately press or release **REV/CAP** *button.*

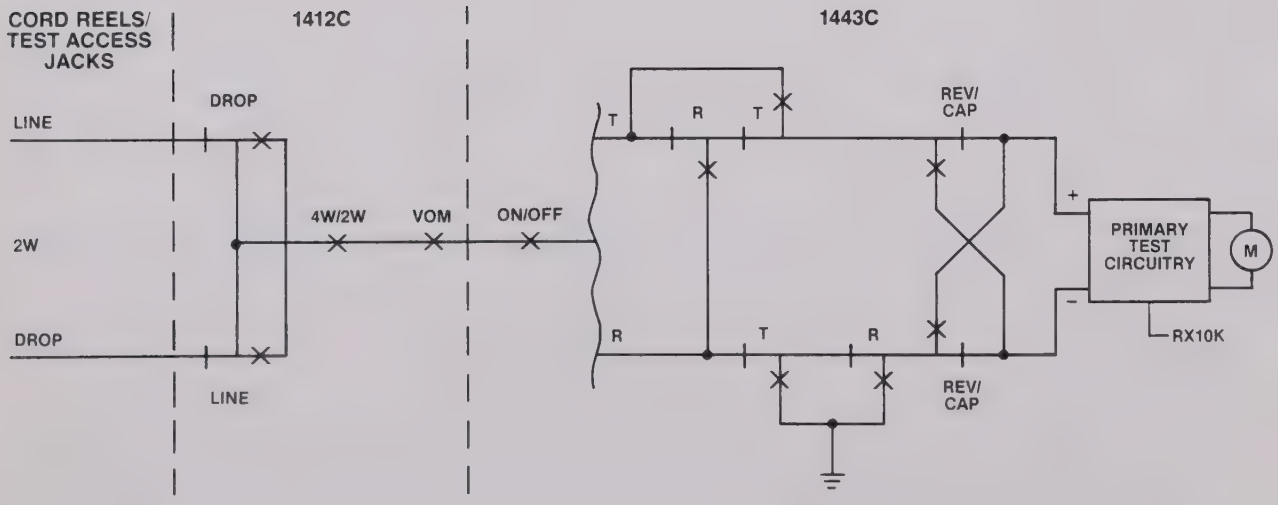
6	If tip-to-ring current is to be measured, press the 1412C **LINE** or **DROP SPLIT** button corresponding to the circuit side to be measured.
7	Press the 1443C **T** or **R** button to read current in the tip or ring lead respectively. If neither button is pressed, tip-to-ring current will be measured in the selected line or drop side.
8	Press the 1443C **ON/OFF** button.
9	Observe the 1443C meter for current reading.

PROCEDURE 6
TWO WIRE VOM TEST—CAPACITIVE KICK

This procedure is used to check capacitance across a two-wire circuit by charging circuit capacitance with the Facility's ohmmeter power supply. Power supply voltage polarity is then reversed and the resulting discharge of circuit capacitance through the meter produces rapid meter deflection (kick) to the right. This is followed by a slower movement to the left as the circuit capacitance recharges in the reverse direction. The amount of downscale meter deflection (to the right) and time to return is proportional to circuit capacitance.



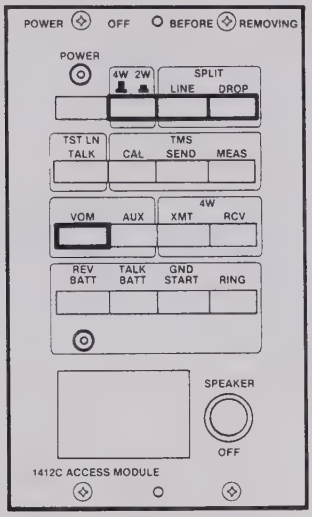


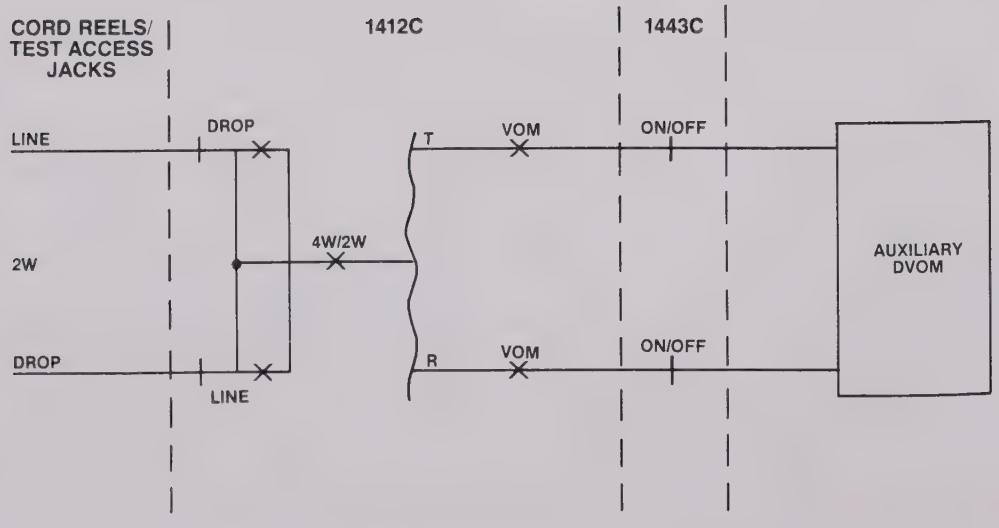


STEP	PROCEDURE
1	Perform Procedure 3, "Two wire VOM Test—Voltage Measurement" for both ac and dc voltage, and for the tip/ring circuit to be selected below. *Caution: If any ac or dc voltage is measured, DO NOT continue with capacitive kick test.*
2	Release all 1443C buttons.
3	Press the 1443C **RX10K** button.
4	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed (may already be pressed).
5	Press the 1443C **T** or **R** button to select tip to ground or ring to ground test respectively. If neither button is pressed, test will be across tip and ring.
6	Press the 1443C **ON/OFF** button.
7	When the 1443C meter stabilizes, press or release the 1443C **REV/CAP** button while observing the meter. The meter will deflect to the right (downscale) and then return to a stable reading.
8	Repeat step 7 as often as necessary to get a good capacitance indication.

PROCEDURE 7
TWO WIRE VOM TEST—VOLTAGE, RESISTANCE, AND CAPACITANCE MEASUREMENT ON AUXILIARY DVOM

This procedure is used to measure ac/dc voltage, resistance, and capacitance on a two-wire circuit, using an auxiliary DVOM. The auxiliary DVOM may be hardwired into the 1400 Test Facility, or connected via patch cords to the Test Facility Test Access Jackfield.



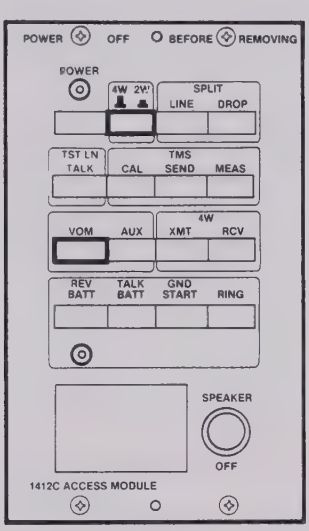


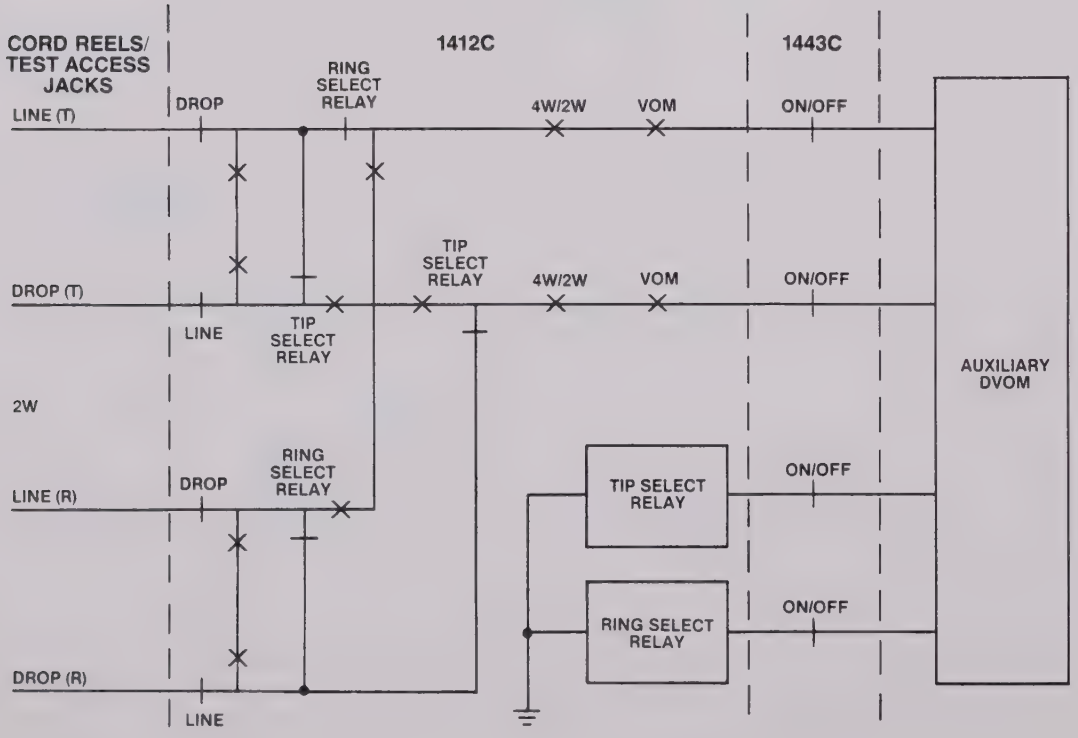
STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	If the auxiliary DVOM is not hardwired into the Test Facility, connect the DVOM input to the **AUX DVOM** jack on the Test Access Jackfield.
3	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary). *Caution: Always measure ac and dc voltage on a circuit before measuring resistance or capacitance. Measurement of resistance or capacitance on a circuit with voltage present may damage the DVOM.* *Note:* Refer to the DVOM User Manual as necessary in performing the following steps.
4	Select an appropriate ac or dc voltage range at the DVOM.
5	Select the desired tip-to-ring, tip-to-ground, or ring-to-ground voltage measurement conditions at the DVOM.
6	If the Test Facility contains a 1443C VOM Module, ensure that the 1443C **ON/OFF** button is released.
7	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed.
8	Press the 1412C **VOM** button, and observe the DVOM meter for voltage reading. *Caution: Continue below only if zero voltage is measured for all tip/ring/ground conditions.*
9	Select the desired resistance and capacitance ranges and tip/ring/ground conditions at the DVOM, and observe the DVOM meter for readings. *Note:* Measured capacitance must be adjusted for the capacitance of any terminating equipment.

PROCEDURE 8
TWO WIRE VOM TEST—CURRENT MEASUREMENT ON AUXILIARY DVOM

This procedure is used to measure current in a two-wire circuit, using an auxiliary DVOM. The DVOM may be hardwired into the 1400 Test Facility, or connected via patch cords to the Test Facility Test Access Jackfield.

Note: This procedure requires that the DVOM provide output voltages to activate the tip and ring selection relays in the 1412C, when the respective tip/ring current test is selected. Voltage of -48 Vdc is required for each relay, and only one relay may be activated at any time as selected at the DVOM.

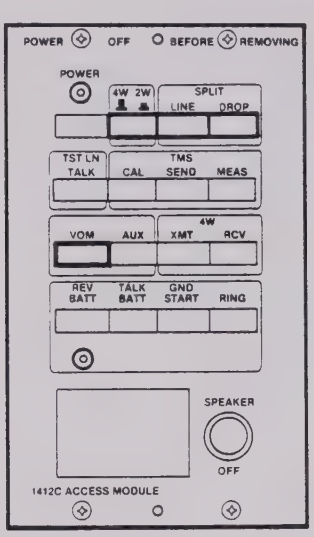


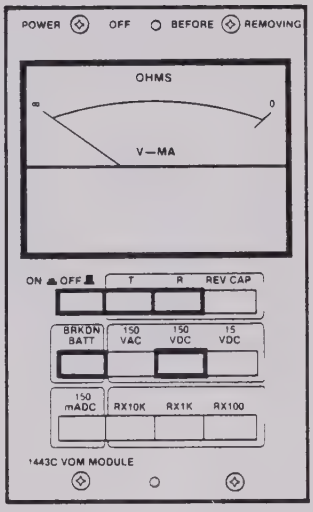


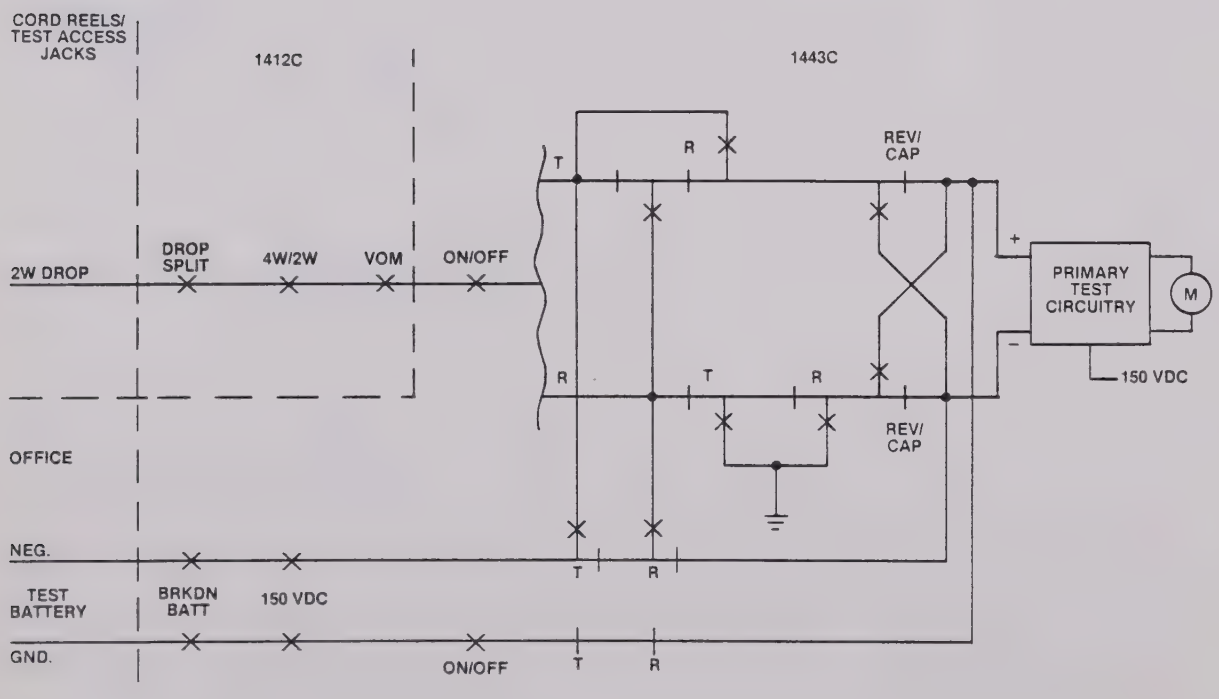
STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	If the auxiliary DVOM is not hardwired into the Test Facility, connect the DVOM to the Test Access Jackfield as follows: (a) DVOM input to **AUX DVOM** jack. (b) DVOM tip/ring selector voltages to **TT/RR** jack.
3	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
4	If the Test Facility contains a 1443C VOM Module ensure that the 1443C **ON/OFF** button is released. *Note:* Refer to the DVOM User Manual as necessary in performing the following steps.
5	Select an appropriate ac or dc current range at the DVOM.
6	Select the desired tip or ring current measurement conditions at the DVOM.
7	Press the 1412C **VOM** button, and observe the DVOM meter for current reading.

PROCEDURE 9
TWO WIRE VOM TEST—BREAKDOWN

This procedure is used to apply breakdown voltage to unwanted leakage resistance across a circuit pair. The breakdown voltage should either burn out the leakage path (eliminate it), or cause the leakage resistance to decrease, allowing easier isolation of the problem.



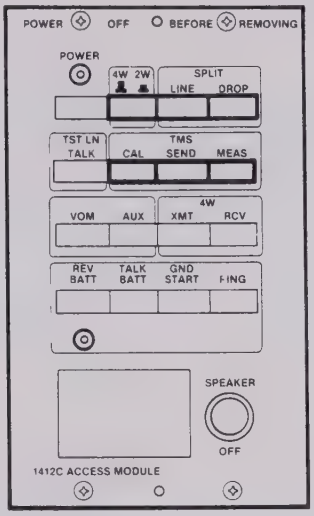


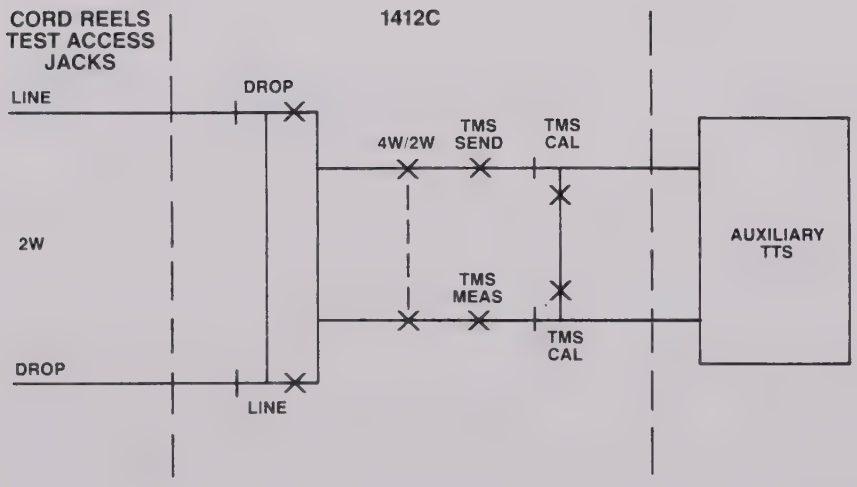


STEP	PROCEDURE
	Caution: During this procedure, an external breakdown battery voltage will be applied across the circuit pair, or across one side of the circuit pair and ground. Disconnect the circuit pair from any office equipment to prevent accidental damage. Do not perform this test on the equipment side of the circuit
1	Connect the **2W DROP** test cord/jack to the access jack for the circuit to which breakdown voltage is to be applied.
2	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
3	Press the 1412C **VOM** and **DROP SPLIT** buttons.
4	Press the 1443C **150 VDC** button.
5	Press the 1443C **T** or **R** button to select tip to ground or ring to ground respectively for breakdown voltage application. If neither button is pressed, breakdown voltage will be applied across tip and ring.
6	If breakdown voltage is to be applied across tip and ring (**T** and **R** buttons both released), select desired polarity with the 1443C **REV/CAP** button as follows: (a) **REV/CAP** button released—Negative to ring, positive to tip. (b) **REV/CAP** button pressed—Negative to tip, positive to ring.
7	Press the 1443C **ON/OFF** button.
	Caution: Do not handle test cords or cord plugs while **BRKDN BATT** *button is pressed.*
8	Press and hold the 1443C **BRKDN BATT** button to apply breakdown voltage to the selected circuit pair. The breakdown voltage will be indicated on the 1443C meter, and will be applied to the circuit as long as the **BRKDN BATT** button is held pressed.

PROCEDURE 10
TWO WIRE TRANSMISSION TEST

This procedure is used to send a test tone over a two-wire circuit to a remote Transmission Test Set (TTS), or to receive and measure a test tone over a two-wire circuit from a remote TTS or office milliwatt. Tones are sent and measured at the 1400 Test Facility by means of an auxiliary TTS connected to the Test Facility. The auxiliary TTS may be hardwired into the 1400 Test Facility, or connected via patch cords to the Test Facility Test Access Jackfield.

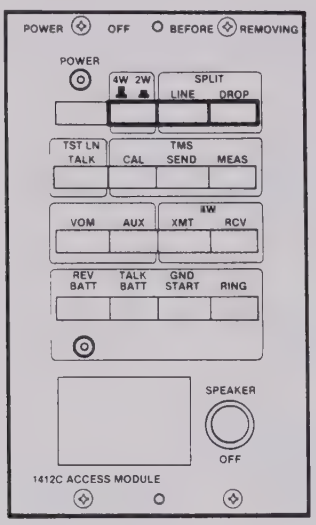


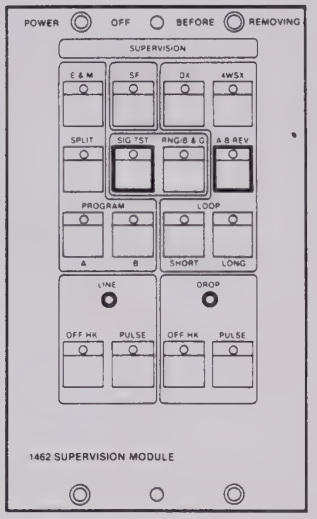


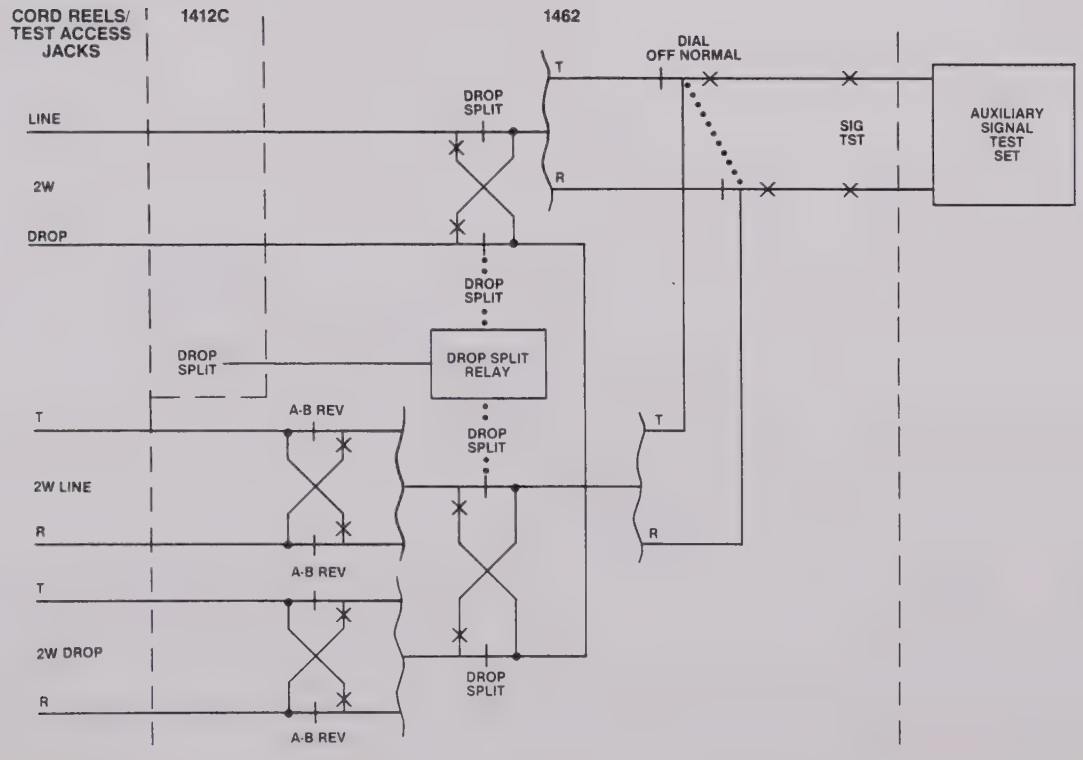
STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
	Note: Refer to the TTS User Manual as necessary in performing the following steps.
3	Connect the auxiliary TTS to the TTS jacks in the Test Facility Test Access Jackfield (if not already wired into the Test Facility).
4	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed.
5	Select the desired TTS oscillator and measurement parameters.
6	If TTS oscillator output is to be measured before connecting to an accessed circuit: (a) Press the 1412C **TMS CAL** button. (b) Read the output signal level and frequency on the TTS front panel. (c) Release the 1412C **TMS CAL** button.
7	To send a test tone on the accessed circuit, press the 1412C **TMS SEND** button.
8	To receive and measure a test tone, press the 1412C **TMS MEAS** button. Observe the TTS display panel for readings.

PROCEDURE 11
TWO WIRE SIGNAL TEST—SEND OR MEASURE LOOP/B & G PULSES

This procedure is used to send continuous loop or battery and ground (B & G) pulses on a two-wire circuit, or to measure loop and B & G pulses received on a two-wire circuit. Pulses are sent and measured by means of an auxiliary signal test set connected to the Test Facility, and pulse characteristics sent and measured are dependent upon the capabilities of the signal test set used. The auxiliary test set may be hardwired into the Test Facility or patched to the Test Facility Test Access Jackfield.



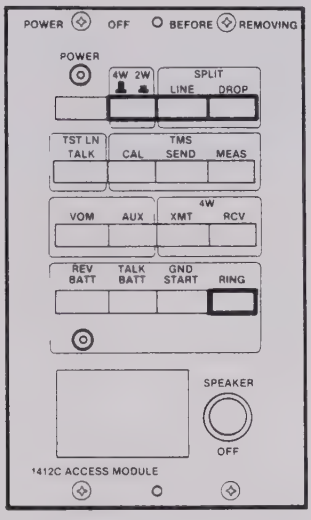


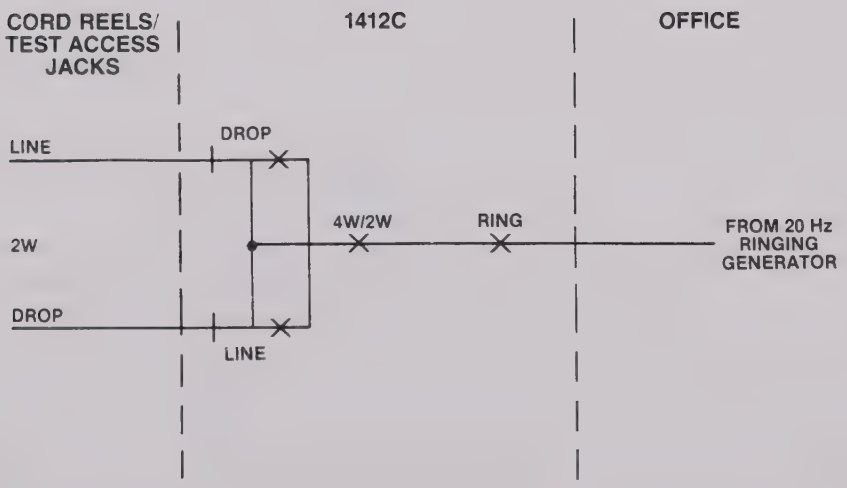


STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
3	If the auxiliary signal test set is not hardwired into the Test Facility, connect the signal test set input and output to the respective **SIG TST RCV** and **SND** jacks on the Test Access Jackfield.
4	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed.
5	Select the desired loop or B & G pulse generation or measurement conditions at the signal test set. Refer to the signal test set user manual as necessary.
6	Press the 1462 **SIG TST** button (**SIG TST** indicator lit) to send or measure loop/B & G signaling.

PROCEDURE 12
TWO WIRE SIGNALING—SEND RINGING SIGNAL

This procedure is used to send the office ringing signal over a split two-wire circuit.

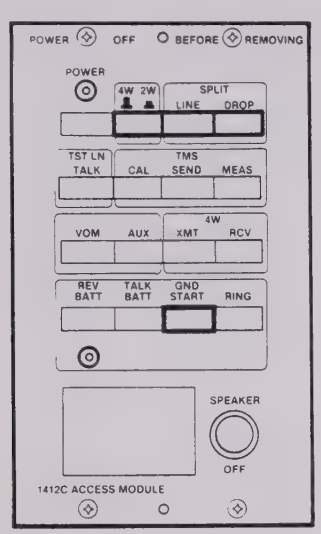


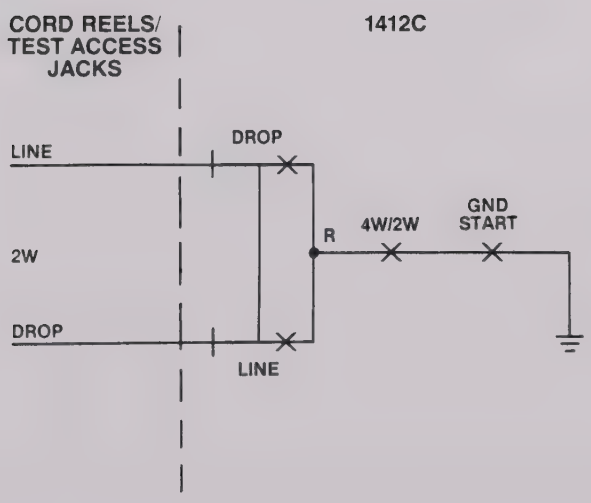


STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit on which ringing will be sent.
2	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
3	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the ringing signal is to be sent. *Caution: The 1412C* **4W/2W** *and either the* **LINE** *or* **DROP SPLIT** *button must be pressed before pressing the* **RING** *button.*
4	Press the 1412C **RING** button.

PROCEDURE 13
TWO WIRE SIGNALING—SEND GROUND START

This procedure is used to seize PBX trunks by applying a momentary ground to the ring lead of a split two-wire circuit. Application of the ground actuates the line relay in the central office.

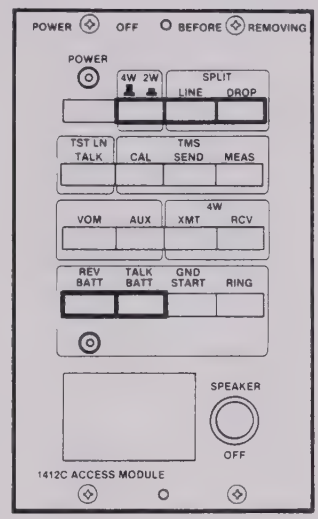


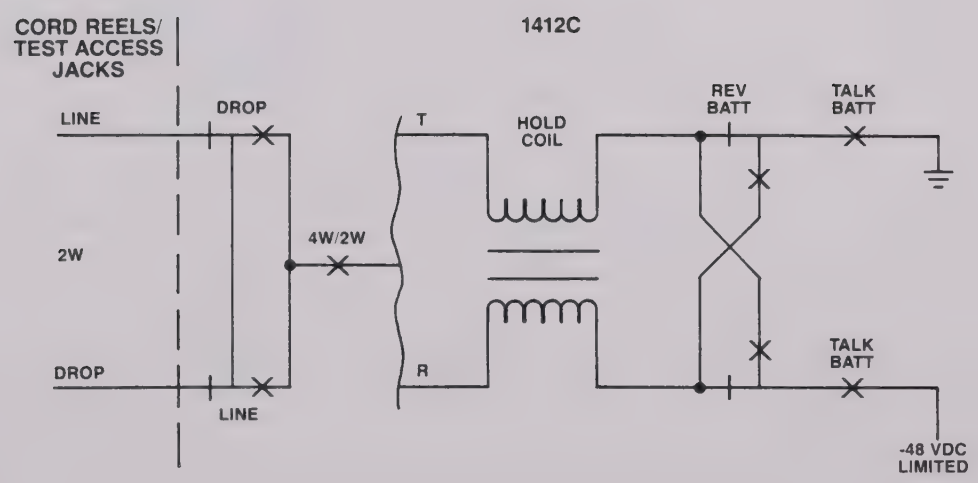


STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be signaled.
2	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
3	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which ground start is to be sent.
4	Press the 1412C **GND START** button. Hold pressed as long as necessary to seize the trunk.

PROCEDURE 14
TWO WIRE TALK BATTERY—SEND

This procedure is used to send –48 Vdc talk battery on a split two-wire circuit.

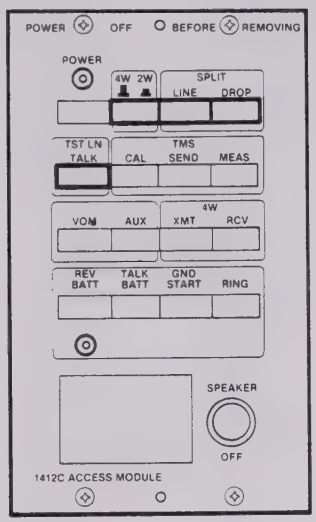


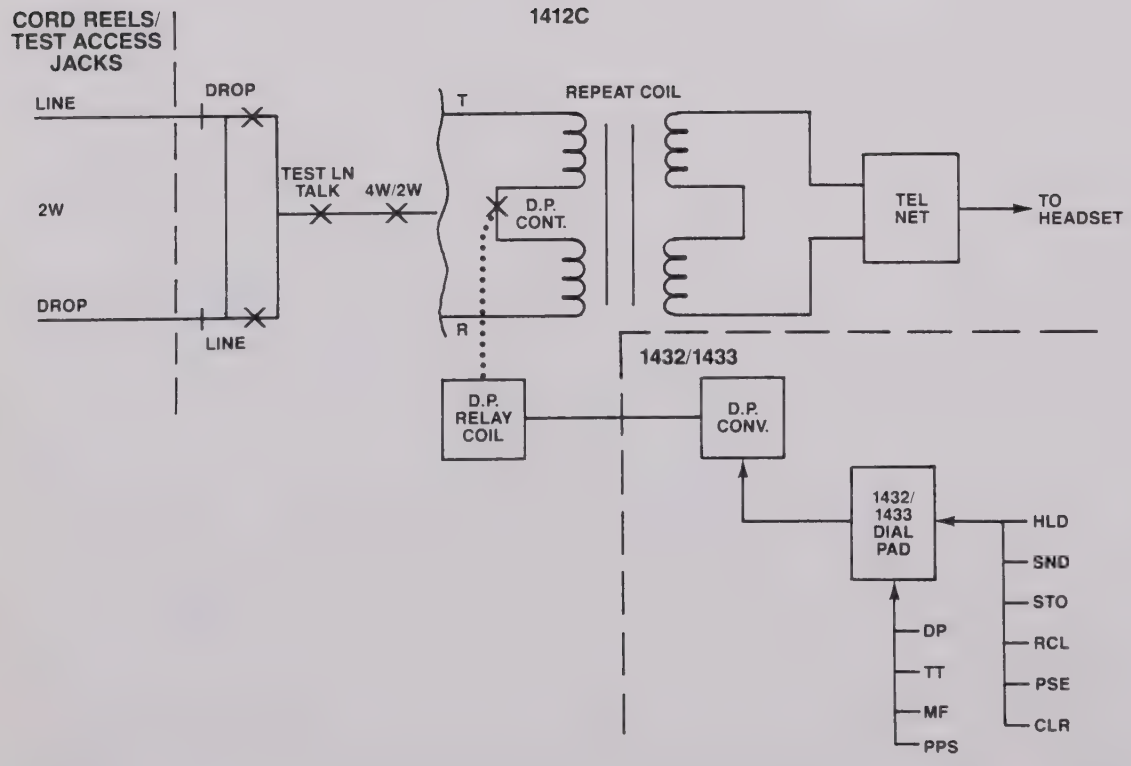


STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit on which talk battery will be sent.
2	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
3	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which talk battery is to be sent.
4	Select the desired talk battery polarity with the 1412C **REV BATT** button as follows: (a) Button released—Ground to tip, talk battery to ring. (b) Button pressed—Ground to ring, talk battery to tip.
5	Press the 1412C **TALK BATT** button.

PROCEDURE 15
TWO WIRE LOOP SIGNALING

This procedure is used to dial up a two-wire circuit to be tested.



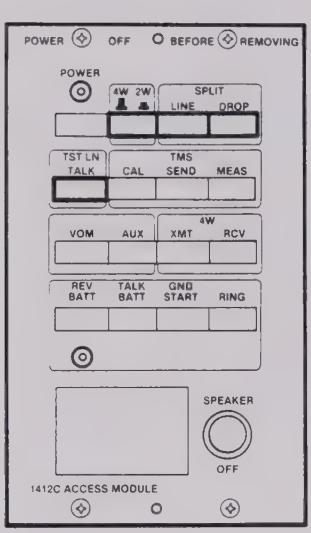


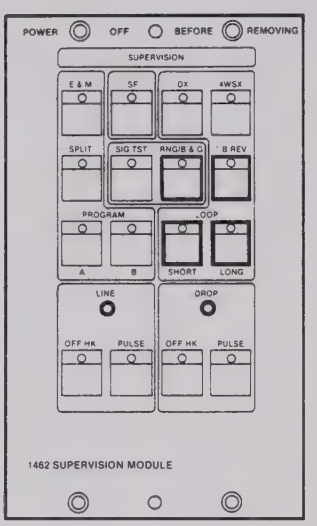
STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be dialed up.
2	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
3	Press the 1412C **TST LN TALK** button.
4	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side to be dialed.
5	At the 1422 Communication Module(s), release or place on hold all active telephone lines. Refer to Procedure 42 if necessary.
6	Select one of the following dialing modes, and perform the corresponding procedure to dial out on the accessed circuit. The indicated 1432 or 1433 Signal Module is required for each dialing mode. (a) Manual DP Mode (1432 or 1433)—Procedure 45. (b) Manual DP, TT, or MF Mode with Last Number Recall (1432 or 1433)—Procedure 46. (c) Store and Forward DP, TT, or MF Mode (1432 or 1433)—Procedure 47. (d) Abbreviated Recall DP, TT, or MF Mode (1432)—Procedure 48. Talking is now possible on the dialed circuit via headset plugged into the Test Facility headset jacks.
7	Perform the desired test(s) on the dialed up two-wire circuit.

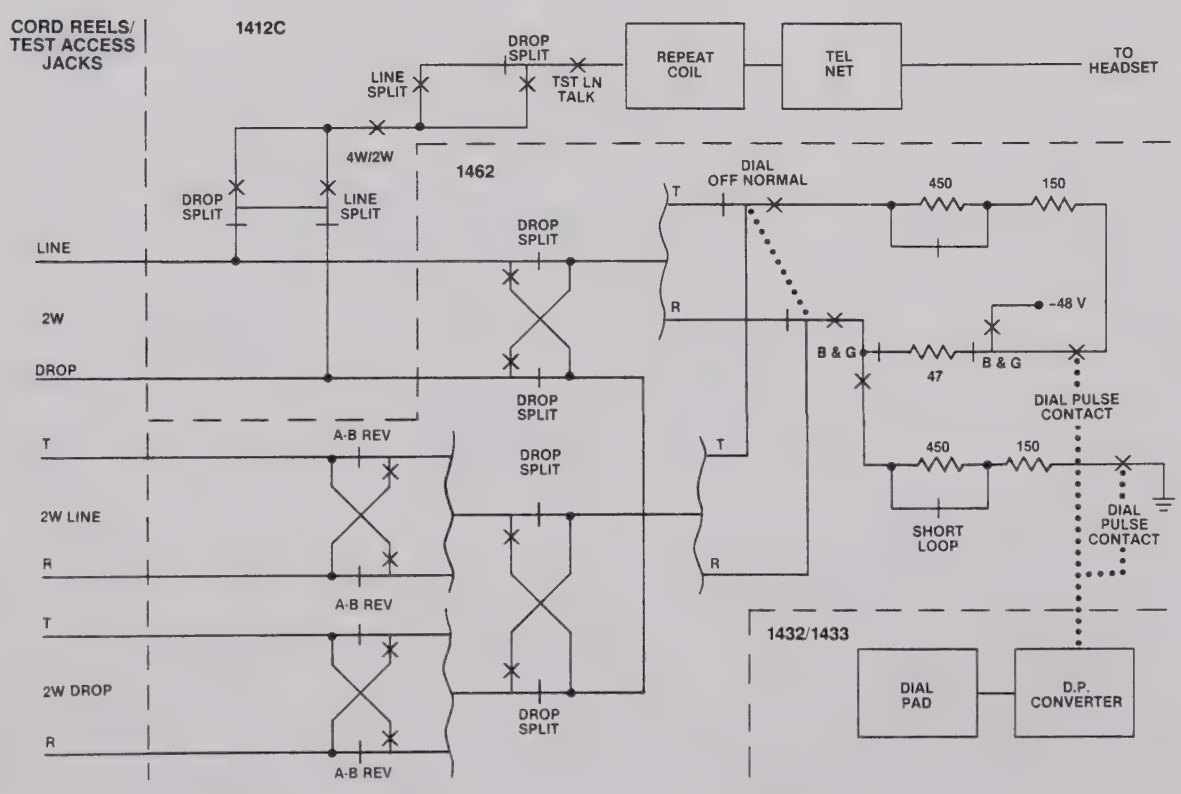
PROCEDURE 16
TWO-WIRE LOOP/B & G SIGNALING VIA SUPERVISION MODULE

This procedure is used to signal on a two-wire circuit accessed via the 1461 or 1462 Supervision Module through the Cord Reel Panel or Test Access Jackfield. Signaling may be long or short loop or B & G, on either the line or drop side. Talking is possible via headset after the circuit is dialed up.

Before splitting, the circuit is normalled through the 1412C Access Module. This allows bridged monitoring of the circuit to make sure it is idle before beginning the procedure.



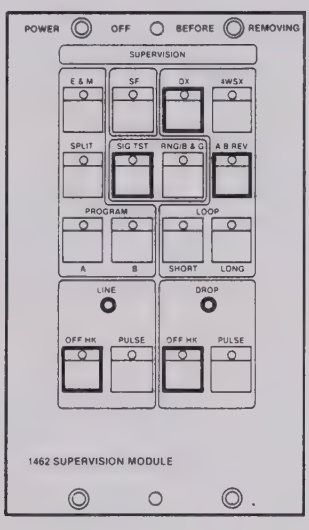


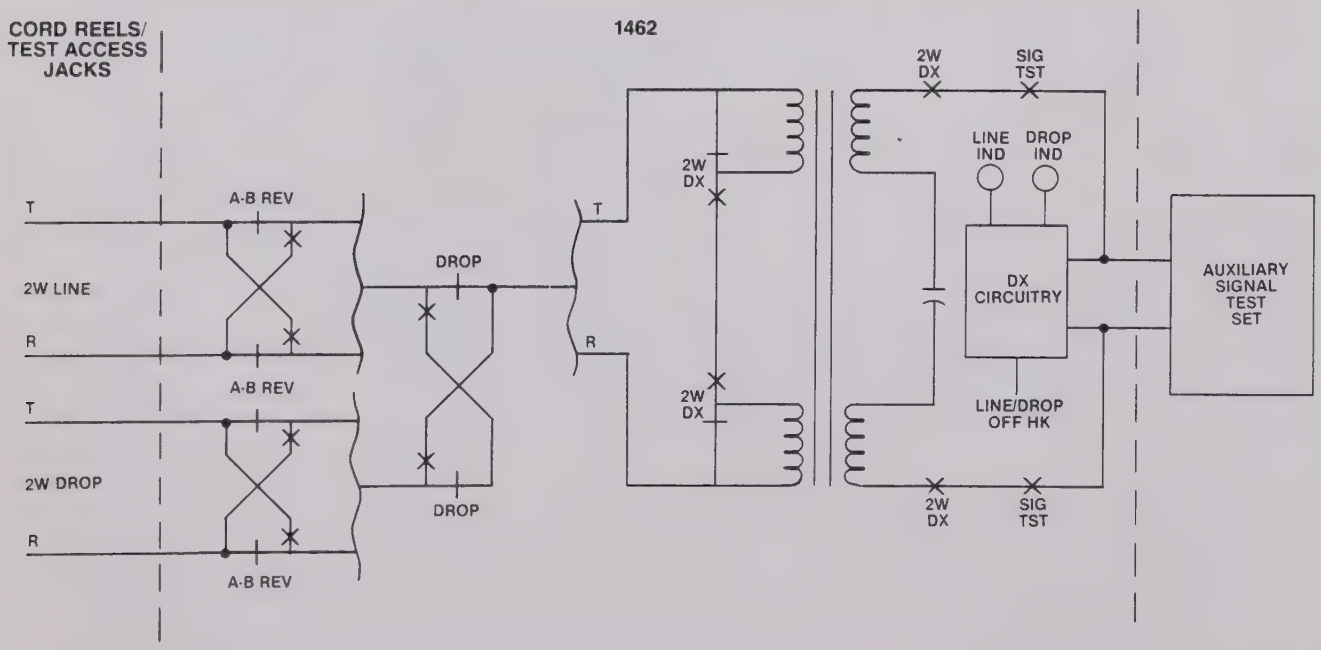


STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be dialed.
2	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
3	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side to be dialed.
4	If battery and ground (B & G) signaling is required, press the 1462 **RNG-B & G** button (**RNG-B & G** and **LONG LOOP** indicators lit).
5	If reverse tip/ring B & G signaling is required (battery to ring, ground to tip), press the 1462 **A-B REV** button (**A-B REV** indicator lit). If **A-B REV** indicator is not lit, B & G signaling will be normal (battery to tip, ground to ring).
6	Select long or short loop signaling as follows: (a) Signaling in Loop Mode: (1) Long Loop—Press the 1462 **LONG LOOP** button (**LONG LOOP** indicator lit). (2) Short Loop—Press the 1462 **SHORT LOOP** button (**LONG LOOP** indicator not lit). (b) Signaling in B & G Mode: (1) Long Loop—Press the 1462 **LONG LOOP** button (**LONG LOOP** indicator lit). *Note:* Long loop is automatically selected with selection of B & G mode, or can be re-selected after selection of short loop. (2) Short Loop—Press the 1462 **SHORT LOOP** button (**SHORT LOOP** indicator lit).
7	At the 1422 Communication Module(s), release or place on hold all active telephone lines. Refer to Procedure 42 if necessary.
8	Select one of the following dialing modes, and perform the corresponding procedure to dial out on the accessed circuit. The indicated 1432 or 1433 Signal Module is required for each dialing mode. (a) Manual DP Mode (1432 or 1433)—Procedure 45. (b) Manual DP, TT, or MF Mode with Last Number Recall (1432 or 1433)—Procedure 46. (c) Store and Forward DP, TT, or MF Mode (1432 or 1433)—Procedure 47. (d) Abbreviated Recall DP, TT, or MF Mode (1432)—Procedure 48.
9	Press the 1412C **TST LN TALK** button to talk on the circuit via headset.

PROCEDURE 17
TWO WIRE DUPLEX SIGNAL TEST—MONITOR/MEASURE PULSES

This procedure is used to monitor two-wire duplex circuit conditions, and to measure pulses received on a two-wire duplex circuit. Pulses are measured by means of an auxiliary signal test set connected to the Test Facility, and pulse characteristics measured are dependent upon the capabilities of the signal test set used. The auxiliary test set may be hardwired into the Test Facility or patched to the Test Facility Test Access Jackfield.



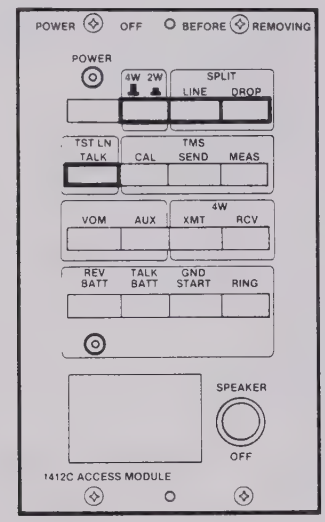


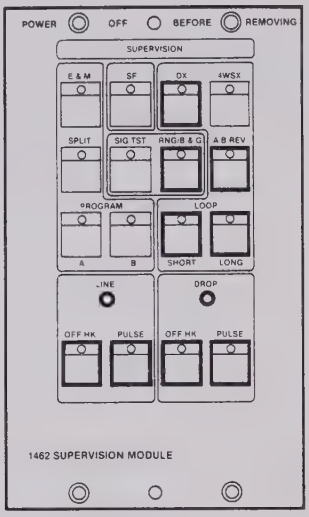
STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
3	If the auxiliary signal test set is not hardwired into the Test Facility, connect the signal test set input and output to the respective **SIG TST RCV** and **SND** jacks on the Test Access Jackfield.
4	Press the 1462 **DX** button (**DX** and **LONG LOOP** indicators lit).
5	If reverse tip/ring **DX** testing is required, press the 1462 **A-B REV** button (**A-B REV** indicator lit).
6	Select the required loop balance condition at the 1462, by pressing/releasing the **LONG** and/or **SHORT LOOP** buttons to give one of the following loop selection indications: (a) Open loop—Neither the **LONG** nor **SHORT LOOP** indicator lit. (b) 3000 ohm loop—**LONG LOOP** indicator lit, and **SHORT LOOP** indicator not lit. (c) 1000 ohm loop—**SHORT LOOP** indicator lit, and **LONG LOOP** indicator not lit. (d) 0 ohm loop—Both **LONG** and **SHORT LOOP** indicators lit.
7	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed.
8	Observe the corresponding 1462 **LINE** or **DROP** indicators for circuit status as follows: (a) Lit—Accessed circuit is on-hook (idle). (b) Not lit—Accessed circuit is off-hook (busy). (c) Flashing—Accessed circuit is signaling.
9	Select E & M pulse measurement mode at the signal test set. Refer to the signal test set user manual as necessary.
10	Press the 1462 **LINE OFF HK** button (if measuring pulses on the drop side) or **DROP OFF HK** button (if measuring on the line side) to seize the circuit.
11	Press the 1462 **SIG TST** button (**SIG TST** indicator lit), and observe the signal test set for pulse measurement.

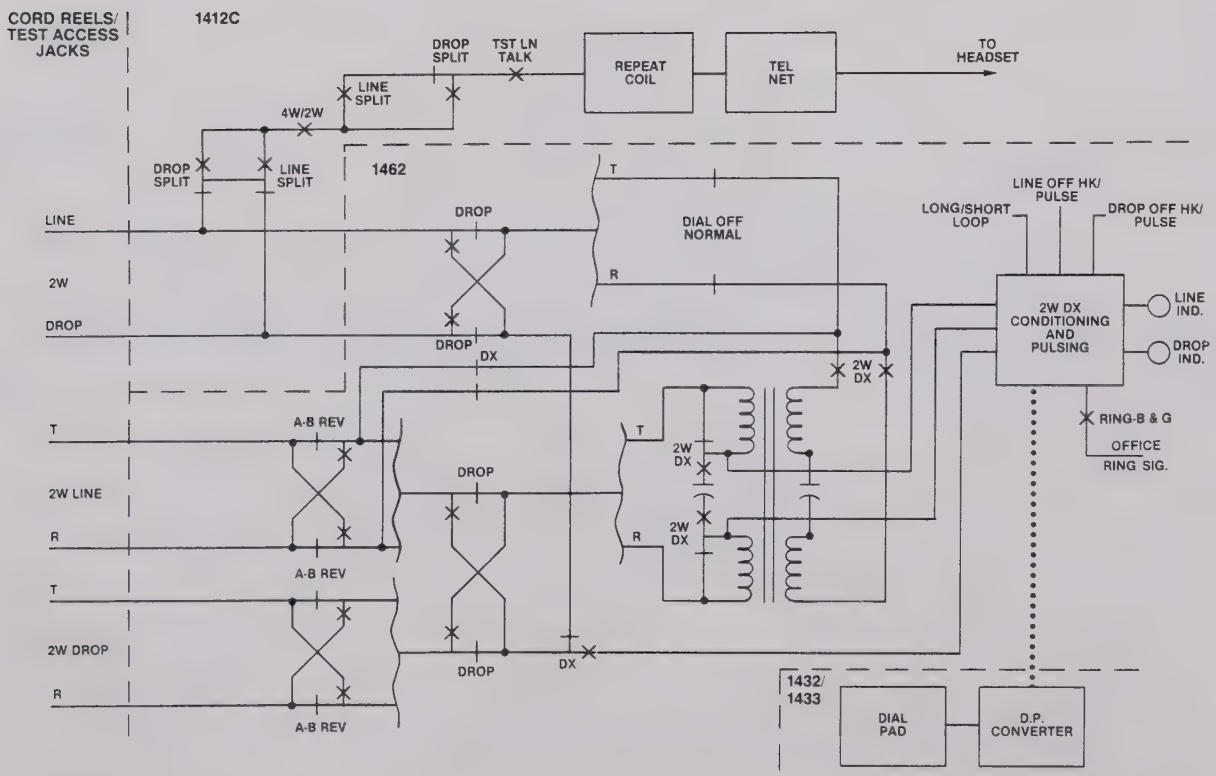
PROCEDURE 18
TWO-WIRE DUPLEX SIGNALING

This procedure is used for DX signaling on a two-wire circuit accessed via the 1462 Supervision Module through the Cord Reel Panel or Test Access Jackfield. DX on-hook, off-hook, and pulsing conditions can be sent on either the line or drop side, and balance can be provided for loops of 0, 1000, or 3000 ohms, or open circuit. Incoming on-hook, off-hook, and pulsing conditions can be monitored after the circuit is split.

Before splitting, the circuit is normalled through the 1412C Access Module. This allows bridged monitoring of the circuit to make sure it is idle before beginning the procedure.





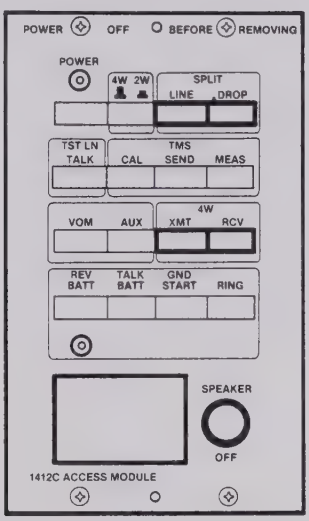


STEP	PROCEDURE
1	Connect the **2W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be signaled.
2	Press the 1412C **4W/2W** button and ensure accessed circuit is idle (see Procedure 1 if necessary).
3	Press the 1462 **DX** button (**DX** and **LONG LOOP** indicators lit).
4	If reverse/tip ring DX monitoring or signaling is required, press the 1462 **A-B REV** button (**A-B REV** indicator lit).
5	Select the required loop balance condition at the 1462, by pressing/releasing the **LONG** and/or **SHORT LOOP** buttons to give one of the following loop selection indications: (a) Open loop—Neither the **LONG** nor **SHORT LOOP** indicator lit. (b) 3000 ohm loop—**LONG LOOP** indicator lit, and **SHORT LOOP** indicator not lit. (c) 1000 ohm loop—**SHORT LOOP** indicator lit, and **LONG LOOP** indicator not lit. (d) 0 ohm loop—Both **LONG** and **SHORT LOOP** indicators lit.
6	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side to be signaled.
7	Observe the corresponding 1462 **LINE** or **DROP** indicator for circuit status as follows: (a) Lit—Accessed circuit is on-hook (idle). (b) Not lit—Accessed circuit is off-hook (busy). (c) Flashing—Accessed circuit is signaling.
8	When the circuit is idle, press the 1462 **LINE** or **DROP OFF HK** button to take the circuit to be signaled off-hook (**LINE** or **DROP OFF HK** indicator lit).
9	Press the 1462 **LINE** or **DROP PULSE** button to enable signaling on the selected circuit (**LINE** or **DROP PULSE** indicator lit).
10	At the 1422 Communication Module(s), release or place on hold all active telephone lines. Refer to Procedure 42 if necessary.
11	Select one of the following signal modes, and perform the corresponding procedure to signal on the accessed circuit. For dialing modes, the indicated 1432 or 1433 Signal Module is required. (a) Direct circuit ringing—Press the 1462 **RNG-B & G** button. Ringing signal will be sent as long as the button is held pressed. (b) Dialing in Manual DP Mode (1432 or 1433)—Procedure 45. (c) Dialing in Manual DP, TT, or MF Mode with Last Number Recall (1432 or 1433)—Procedure 46. (d) Dialing in Store and Forward DP, TT, or MF Mode (1432 or 1433)—Procedure 47. (e) Dialing in Abbreviated Recall DP, TT, or MF Mode (1432)—Procedure 48.
12	Press the 1412C **TST LN TALK** button to talk on the circuit via headset.

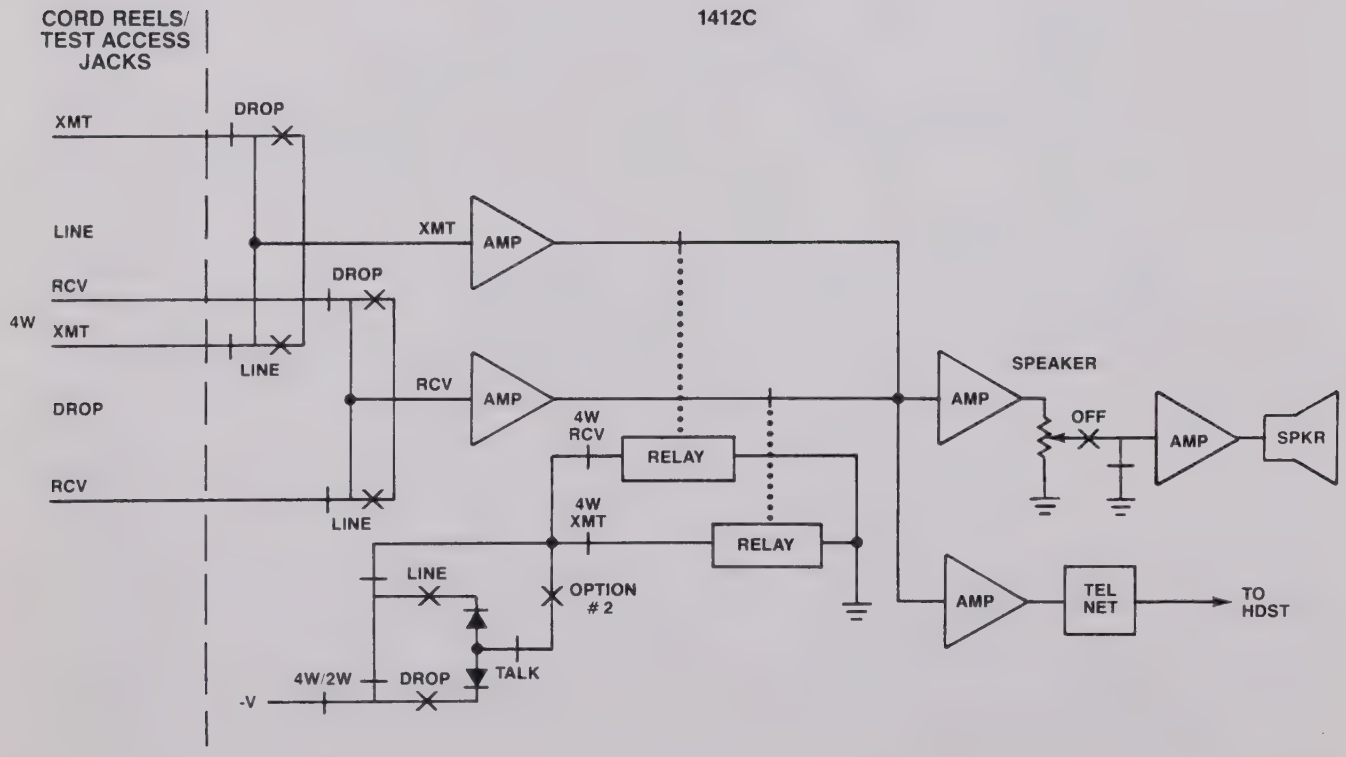
PROCEDURE 19
FOUR WIRE MONITOR—BRIDGED/TERMINATED

This procedure is used to monitor a four-wire circuit to determine, prior to testing, whether it is idle or busy. The procedure provides bridged or terminated monitoring either via headset or via the speaker in the 1412C Access Module.

Note: For terminated circuit monitoring, the 1412C Access Module must include Option #2. Inclusion or exclusion of this option was pre-set at the time of installation (see Volume 2, Section 2 of this User Manual.



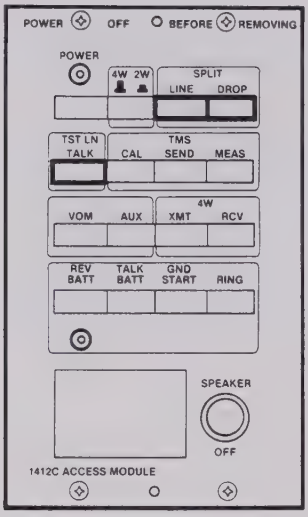
1412C

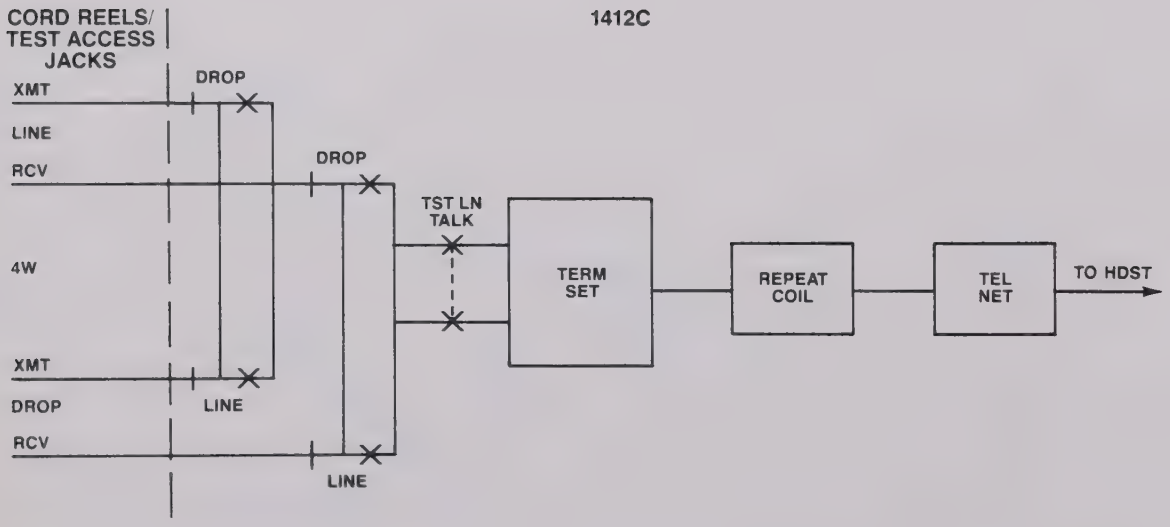


STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be monitored. *Note:* To avoid interruption of service if the circuit is in use, the **LINE** and **DROP** connections must be made to the respective access jacks simultaneously. If double-ended patch cords are used, they must be plugged into the Test Facility jackfield first, then into the access jacks.
2	Monitor via headset or speaker as follows: (a) Headset—Listen on headset plugged into the Test Facility headset jacks. (b) Speaker—Rotate the 1412C **SPEAKER** control clockwise out of detent position, and adjust for desired speaker volume.
3	If the 1412C Access Module includes Option 2, split the circuit to line or drop, if desired, by pressing the respective 1412C **LINE** or **DROP SPLIT** button.
4	Monitor as described in Step 2.
5	To monitor on the transmit or receive pair only, press the respective 1412C **4W XMT** or **RCV** button.

PROCEDURE 20
FOUR WIRE TALK—TERMINATED

This procedure is used to talk on either the line or drop side of a split four-wire circuit.

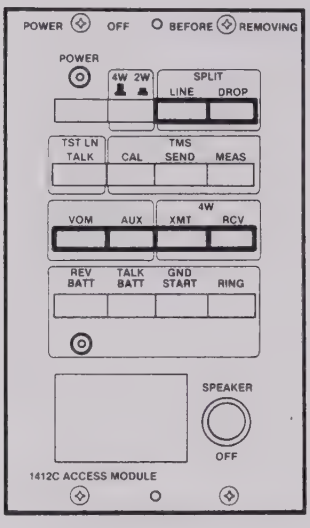


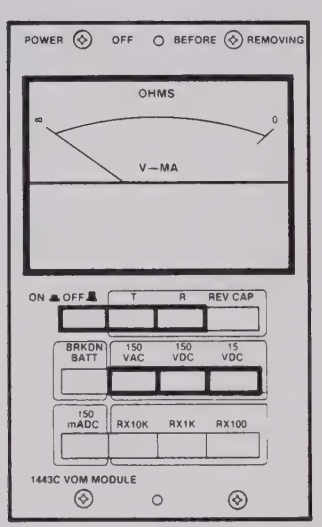


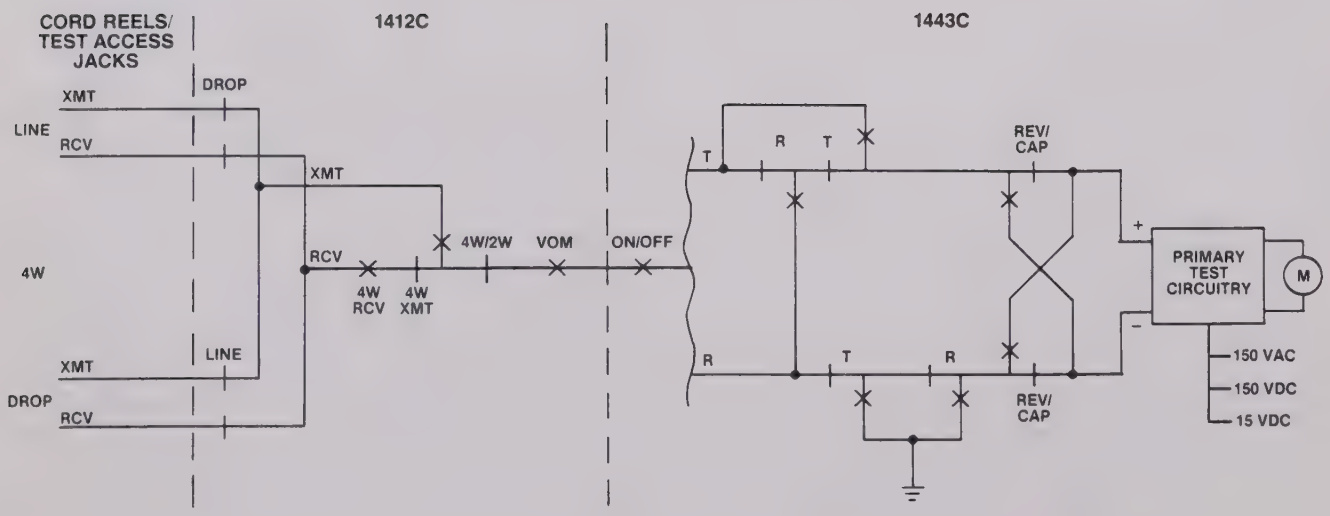
STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit over which talking will take place.
2	Ensure the accessed circuit is idle (see Procedure 19 if necessary).
3	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which talking will take place.
4	Press the 1412C **TST LN TALK** button.
5	Talk on the circuit using a headset plugged into the Test Facility headset jacks.

PROCEDURE 21
FOUR WIRE VOM TEST—VOLTAGE MEASUREMENT

This procedure is used to measure ac or dc voltage on the transmit or receive pair of a split 4-wire circuit. Voltages of up to 150 Vac or dc (either polarity) can be measured between tip and ground, tip and ring, or ring and ground.







STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	Ensure the accessed circuit is idle (see Procedure 19 if necessary).
3	Press the 1412C **VOM** button.
4	Press the 1443C **150 VAC** or **150 VDC** button as desired.
5	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed.
6	Press the 1443C **T** or **R** button to select tip to ground or ring to ground measurement respectively. If neither button is pressed, measurement will be across tip and ring.
7	Refer to the following table for dc polarity that will cause upscale meter readings for different combinations of 1443C **T**, **R**, and **REV/CAP** buttons. Press or release the **REV/CAP** button accordingly. *Note:* The 1443C **REV/CAP** button has no effect on ac voltage readings.

T	R	REV/CAP PRESSED	REV/CAP RELEASED
Pressed	Released	Tip Negative wrt Ground	Tip Positive wrt Ground
Released	Pressed	Ring Positive wrt Ground	Ring Negative wrt Ground
Released	Released	Ring Positive wrt Tip	Tip Positive wrt Ring

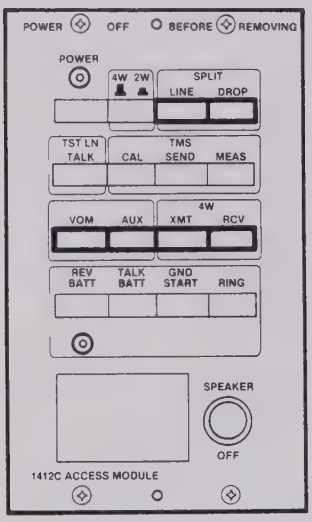
wrt = with respect to

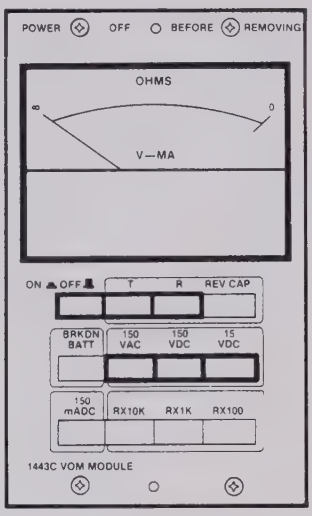
Caution: If the 1443C meter deflects to the left in the following procedures, immediately press or release the **REV/CAP** *button.*

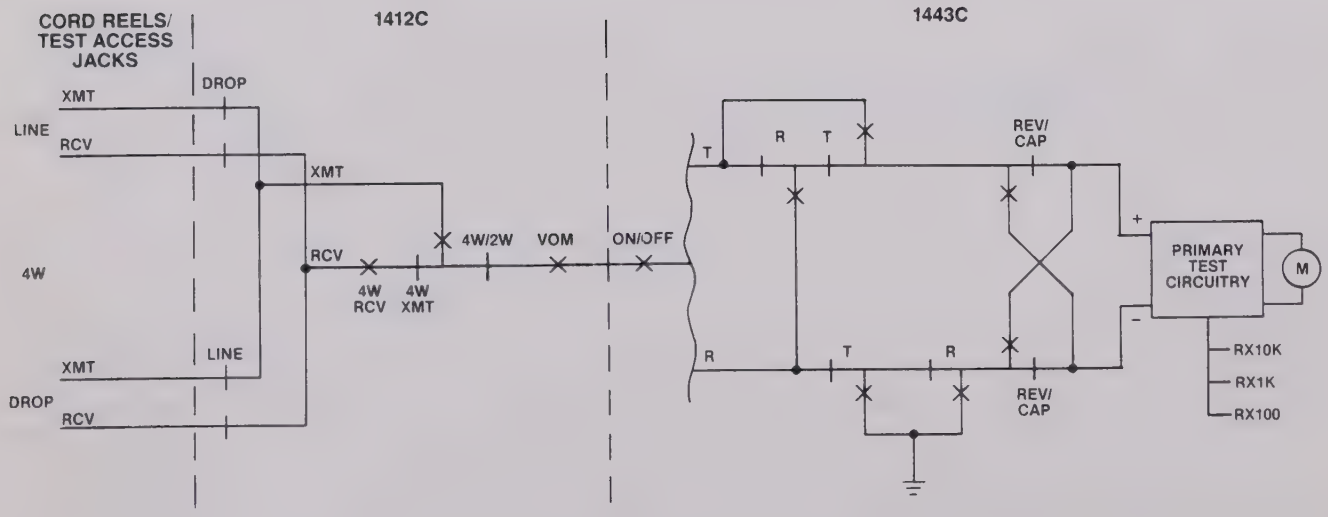
8	Press the 1412C **4W XMT** or **RCV** button to select transmit or receive pair respectively.
9	Press the 1443C **ON/OFF** button.
10	Read the voltage on the 1443C meter. If voltage is less than 15 Vdc, release the 1443C **150 VDC** button, and press the **15 VDC** button.

PROCEDURE 22
FOUR WIRE VOM TEST—RESISTANCE MEASUREMENT

This procedure is used to measure resistance of the transmit or receive pair of a four-wire circuit. Resistance can be measured between tip and ground, tip and ring, or ring and ground.



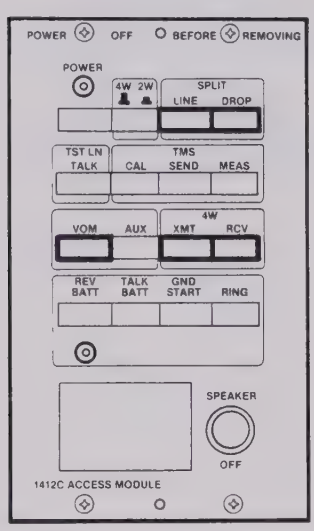


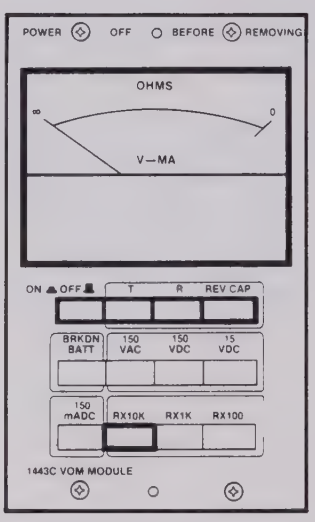


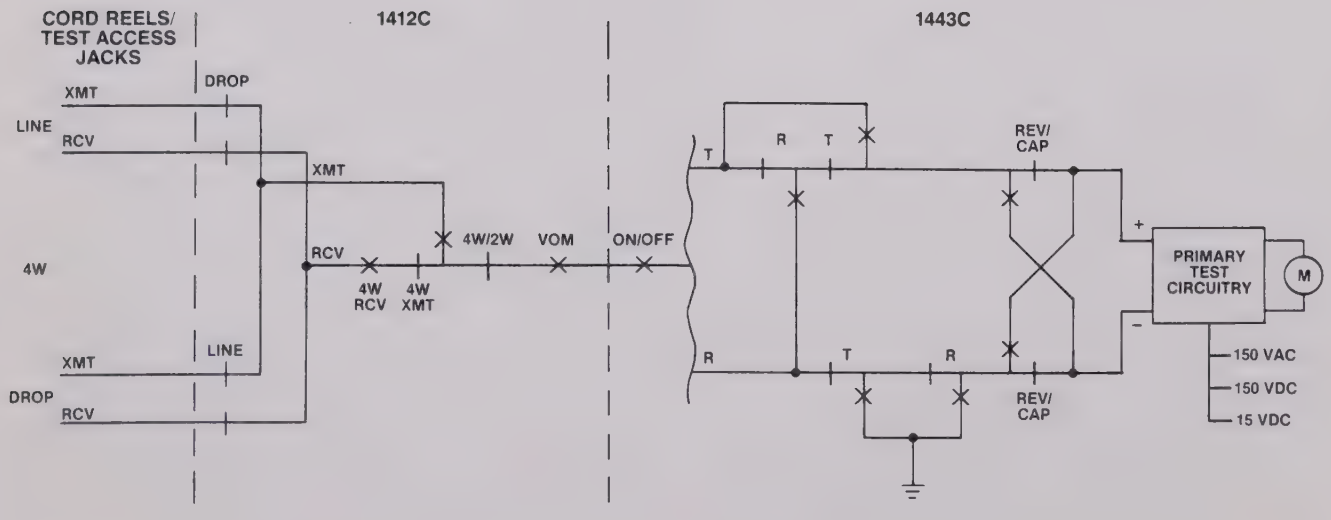
STEP	PROCEDURE
1	Perform Procedure 21, "Four Wire VOM Test—Voltage Measurement" for both ac and dc voltage, and for the tip/ring circuit to be selected below. *Caution: If any ac or dc voltage is measured, DO NOT continue with resistance test.*
2	Release all 1443C buttons.
3	Press the 1443C **RX10K**, **RX1K**, or **RX100** button to select the desired resistance range.
4	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed (may already be pressed).
5	Press the 1412C **4W XMT** or **RCV** button to select transmit or receive pair respectively (may already be pressed).
6	Press the 1443C **T** or **R** button to select tip to ground or ring to ground measurement respectively. If neither button is pressed, measurement will be across tip and ring.
7	Press the 1443C **ON/OFF** button.
8	Observe resistance reading on the 1443C meter.

PROCEDURE 23
FOUR WIRE VOM TEST—CAPACITIVE KICK

This procedure is used to check capacitance across a four-wire transmit or receive pair by charging circuit capacitance with the Facility's ohmmeter power supply. Power supply voltage polarity is then reversed and the resulting discharge of circuit capacitance through the meter produces rapid meter deflection (kick) to the right. This is followed by a slower movement to the left as the circuit capacitance recharges in the reverse direction. The amount of downscale meter deflection (to the right), and time to return is proportional to circuit capacitance.



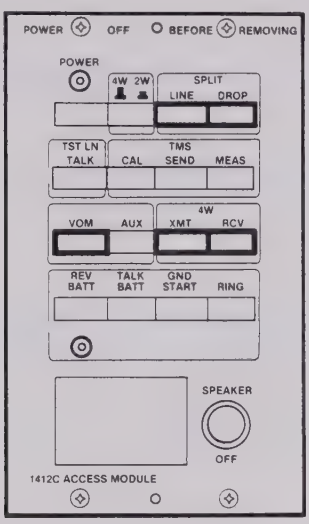


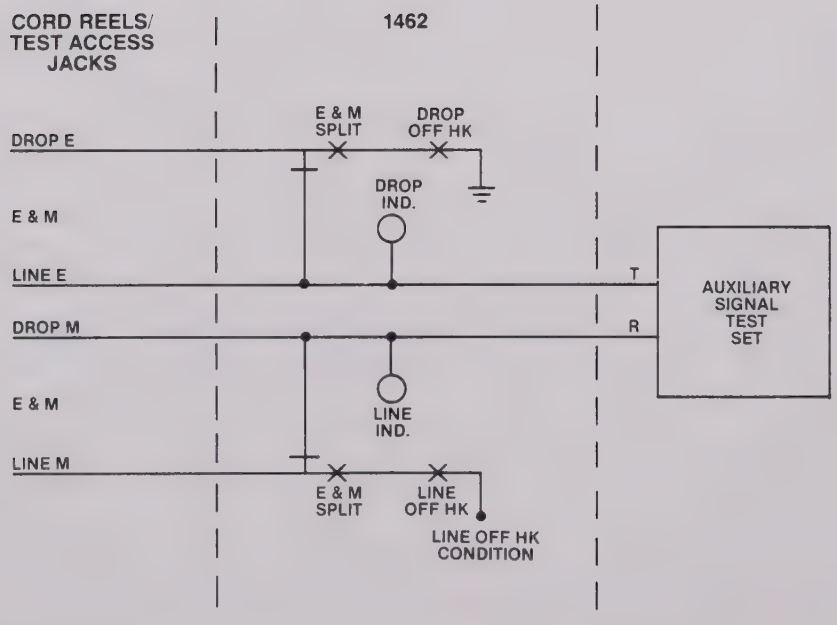


STEP	PROCEDURE
1	Perform Procedure 21 "Four Wire VOM Test—Voltage Measurement" for both ac and dc voltage, and for the tip/ring circuit to be selected below. *Caution: If any ac or dc voltage is measured DO NOT continue with capacitive kick test.*
2	Release all 1443C buttons.
3	Press the 1443C **RX10K** button.
4	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed (may already be pressed).
5	Press the 1412C **4W XMT** or **RCV** button to select transmit or receive pair respectively (may already be pressed).
6	Press the 1443C **T** or **R** button to select tip to ground or ring to ground test respectively. If neither button is pressed, test will be across tip and ring.
7	Press the 1443C **ON/OFF** button.
8	When the 1443 meter stabilizes, press or release the 1443C **REV/CAP** button while observing the meter. The meter will deflect to the right (downscale) and then return to a stable reading.
9	Repeat step 8 as often as necessary to get a good capacitance indication.

PROCEDURE 24
FOUR WIRE VOM TEST—VOLTAGE, RESISTANCE, AND CAPACITANCE MEASUREMENT ON AUXILIARY DVOM

This procedure is used to measure ac/dc voltage, resistance, and capacitance on a four-wire circuit, using an auxiliary DVOM. The auxiliary DVOM may be hardwired into the 1400 Test Facility, or connected via patch cords to the Test Facility Test Access Jackfield.

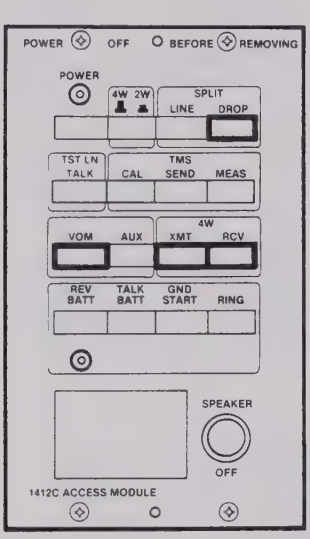


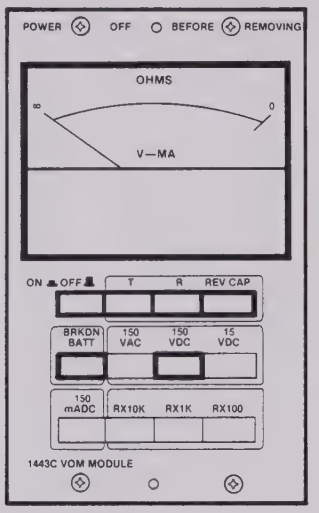


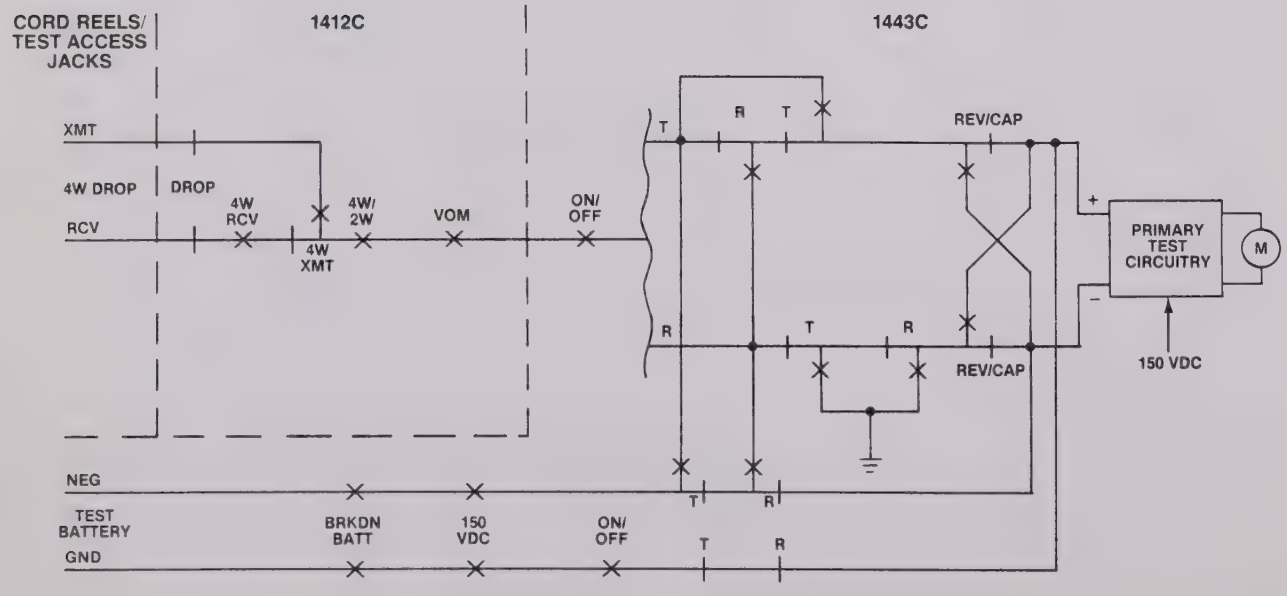
STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	If the auxiliary DVOM is not hardwired into the Test Facility, connect the DVOM input to the **AUX DVOM** jack on the Test Access Jackfield.
3	Ensure the accessed circuit is idle (see Procedure 19 if necessary). *Caution: Always measure ac and dc voltage on a circuit before measuring resistance or capacitance. Measurement of resistance or capacitance on a circuit with voltage present may damage the DVOM.* *Note:* Refer to the DVOM User Manual as necessary in performing the following steps.
4	Select an appropriate ac or dc voltage range at the DVOM.
5	Select the desired tip-to-ring, tip-to-ground, or ring-to-ground voltage measurement conditions at the DVOM.
6	If the Test Facility contains a 1443C VOM Module, ensure that the 1443C **ON/OFF** button is released.
7	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed.
8	Press the 1412C **4W XMT** or **RCV** button to select transmit or receive pair respectively.
9	Press the 1412C **VOM** button, and observe the DVOM meter for voltage reading. *Caution: Continue below only if zero voltage is measured for all tip/ring/ground conditions.*
10	Select the desired resistance and capacitance ranges and tip/ring/ground conditions at the DVOM, and observe the DVOM meter for readings. *Note:* Measured capacitance must be adjusted for the capacitance of any terminating equipment.

PROCEDURE 25
FOUR WIRE VOM TEST—BREAKDOWN

This procedure is used to apply breakdown voltage to unwanted leakage resistance on a four-wire transmit or receive pair. The breakdown voltage should either burn out the leakage path (eliminate it), or cause the leakage resistance to decrease, allowing easier isolation of the problem.



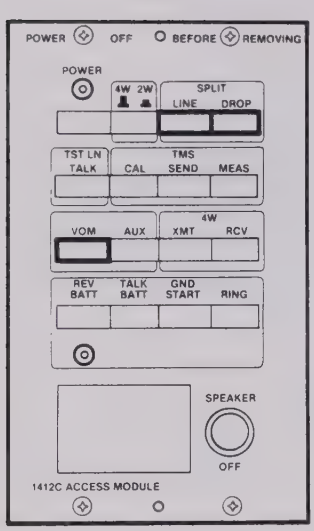


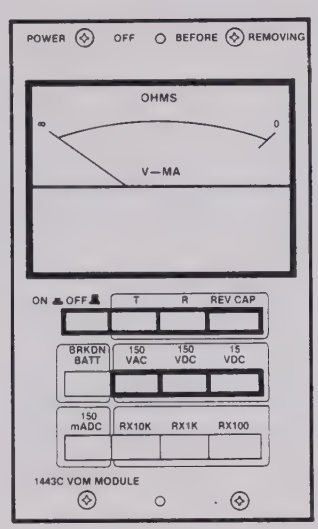


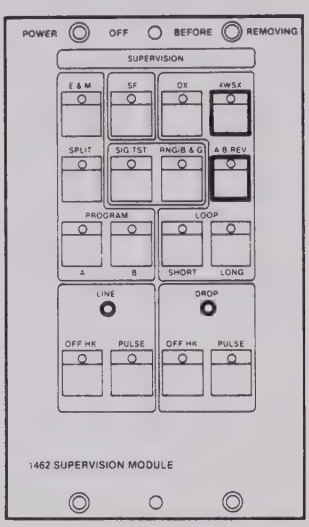
STEP	PROCEDURE
	Caution: During this procedure, an external breakdown battery voltage will be applied across the circuit pair, or across one side of the circuit pair and ground. Disconnect the circuit pair from any office equipment to prevent accidental damage. Do not perform this test on the equipment side of the circuit.
1	Connect the **4W DROP** test cords/jacks to the access jacks for the circuit to which breakdown voltage is to be applied.
2	Ensure the accessed circuit is idle (see Procedure 19 if necessary).
3	Press the 1412C **DROP SPLIT** and **VOM** buttons.
4	Press the 1443C **150 VDC** button.
5	Press the 1412C **4W XMT** or **RCV** button to select transmit or receive pair respectively.
6	Press the 1443C **T** or **R** button to select tip to ground or ring to ground respectively for breakdown voltage application. If neither button is pressed, breakdown voltage will be applied across tip and ring.
7	If breakdown voltage is to be applied across tip and ring (**T** and **R** buttons both released), select desired polarity with the 1443C **REV/CAP** button as follows: (a) **REV/CAP** button released—Negative to ring, positive to tip. (b) **REV/CAP** button pressed—Negative to tip, positive to ring.
8	Press the 1443C **ON/OFF** button.
	Caution: Do not handle test cords or cord plugs while **BRKDN BATT** button is pressed.
9	Press and hold the 1443C **BRKDN BATT** button to apply breakdown voltage to the selected circuit pair. The breakdown voltage will be indicated on the 1443C meter, and will be applied to the circuit as long as the **BRKDN BATT** button is held pressed.

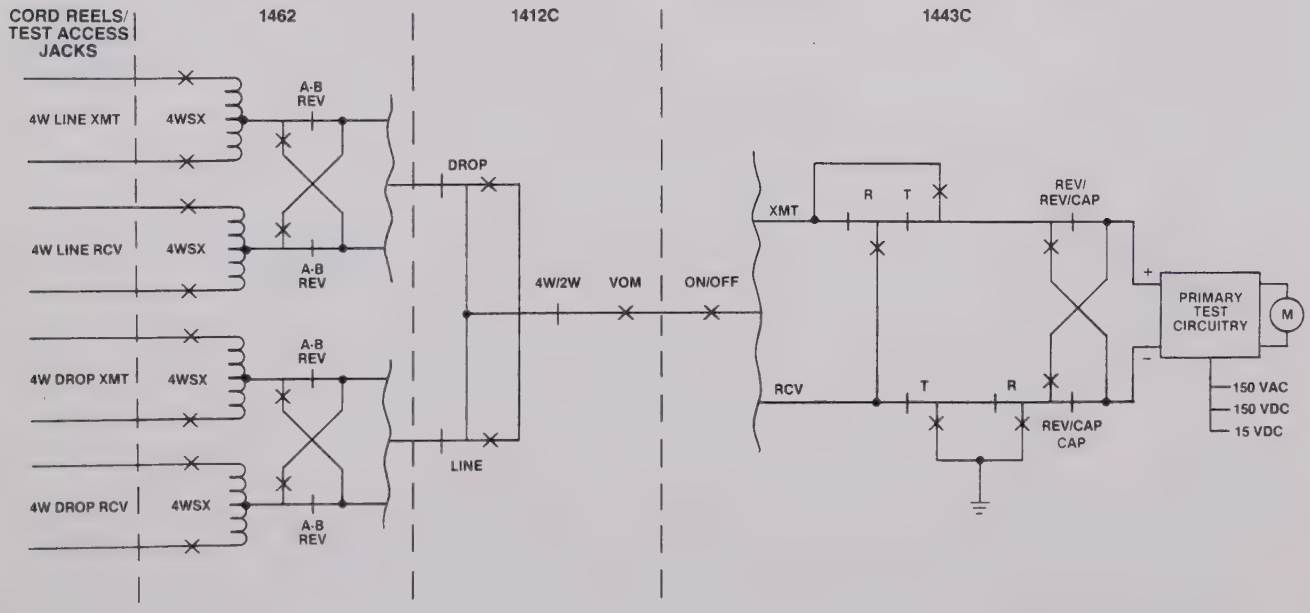
PROCEDURE 26
FOUR WIRE SIMPLEX VOM TEST—VOLTAGE MEASUREMENT

This procedure is used to measure voltage between the transmit and receive pairs of a four-wire simplex circuit, or between the transmit or receive pair and ground. Voltages of up to 150 Vdc (either polarity) or 150 Vac can be measured.









STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	Ensure the accessed circuit is idle (see Procedure 19 if necessary).
3	Press the 1412C **VOM** button.
4	Press the 1462 **4W SX** button (**4W SX** indicator lit).
5	Press the 1443C **150 VAC** or **150 VDC** button to select ac or dc voltage measurement.
6	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side to be tested.
7	Press the 1443C **T** or **R** button to select transmit pair or receive pair to ground respectively. If neither button is pressed, measurement will be across transmit and receive pairs.
8	Refer to the following table for dc polarity that will cause upscale meter readings for different combinations of 1443C **T**, **R**, and **REV/CAP** buttons and the 1462 **A-B REV** button. Press or release the **REV/CAP** and **A-B REV** button(s) accordingly. *Note:* The 1443C **REV/CAP** button and 1462 **A-B REV** button have no effect on ac voltage readings. Ignore references to **A-B REV** button if the Test Facility does not contain a 1462 Module.

T	R	BOTH REV/CAP AND A-B REV RELEASED	EITHER REV/CAP OR A-B REV RELEASED (NOT BOTH)
Pressed	Released	XMT Pair Positive wrt Ground	XMT Pair Negative wrt Ground
Released	Pressed	RCV Pair Negative wrt Ground	RCV Pair Positive wrt Ground
Released	Released	XMT Pair Positive wrt RCV Pair	XMT Pair Negative wrt RCV Pair

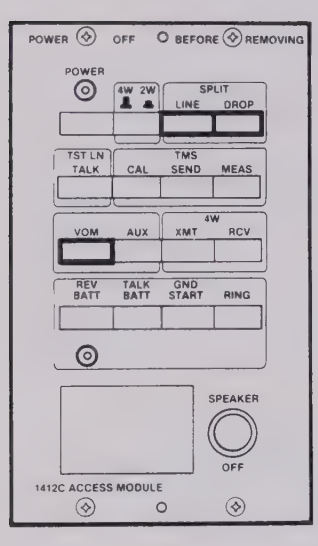
wrt = with respect to

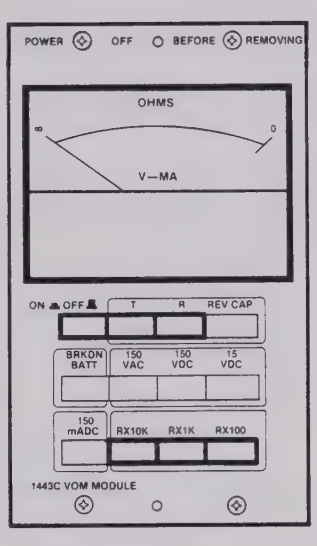
Caution: If the 1443C meter deflects to the left in the following procedure, immediately press or release the **REV/CAP** *button.*

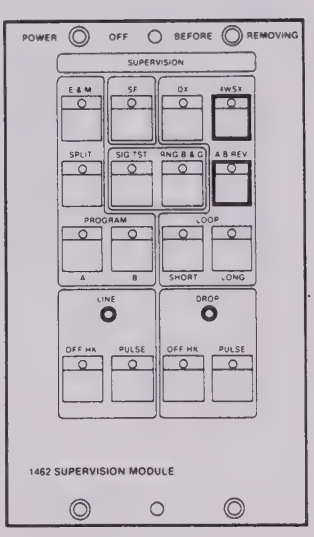
9	Press the 1443C **ON/OFF** button.
10	Read the voltage on the 1443C meter. If voltage is less than 15 Vdc, release the 1443C **150 VDC** button, and press the **15 VDC** button.

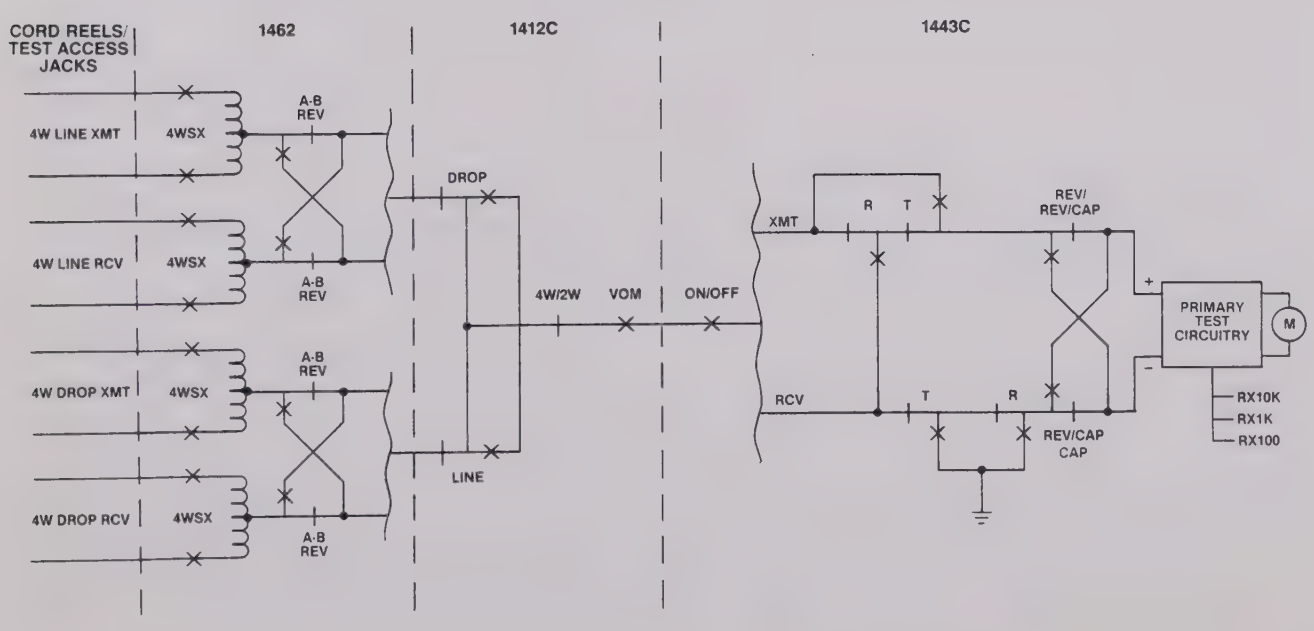
PROCEDURE 27
FOUR WIRE SIMPLEX VOM TEST—RESISTANCE MEASUREMENT

This procedure is used to measure resistance between the transmit and receive pairs of a four-wire simplex circuit, or between the transmit or receive pair and ground.





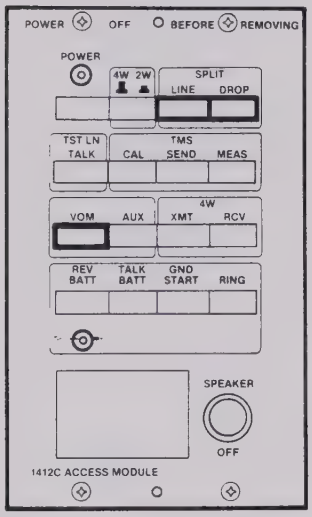


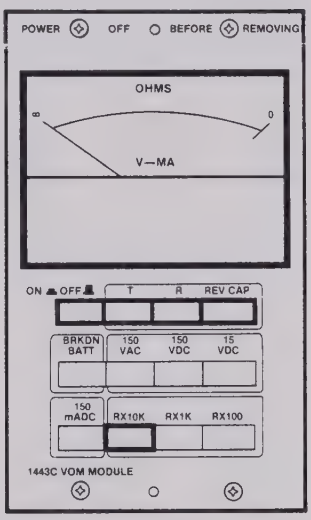


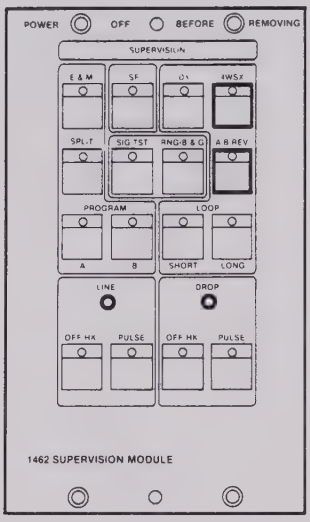
STEP	PROCEDURE
1	Perform Procedure 26, "Four Wire Simplex VOM Test—Voltage Measurement" for both ac and dc voltage, and for the transmit/receive pair circuit to be selected below. *Caution: If any ac or dc voltage is measured, DO NOT continue with resistance measurement.*
2	Release all 1443C buttons except **ON/OFF**.
3	Press the 1443C **RX10K**, **RX1K**, or **RX100** button to select the desired resistance range.
4	Press the 1443C **T** or **R** button to select transmit or receive pair to ground respectively. If neither button is pressed, measurement will be between transmit and receive pairs.
5	Observe resistance reading on the 1443C meter.

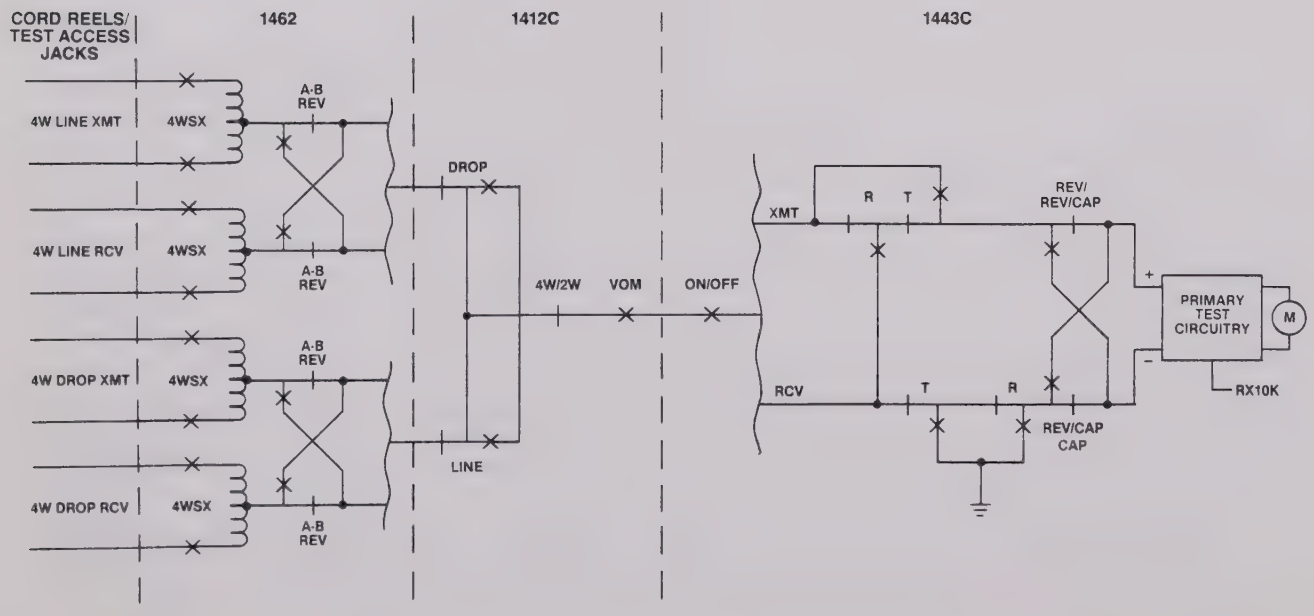
PROCEDURE 28
FOUR WIRE SIMPLEX VOM TEST—CAPACITIVE KICK

This procedure is used to check capacitance on a four-wire simplex circuit by charging circuit capacitance with the Facility's ohmmeter power supply. Power supply voltage polarity is then reversed and the resulting discharge of circuit capacitance through the meter produces rapid meter deflection (kick) to the right. This is followed by a slower movement to the left as the circuit capacitance recharges in the reverse direction. The amount of downscale meter deflection (to the right) and time to return is proportional to circuit capacitance.





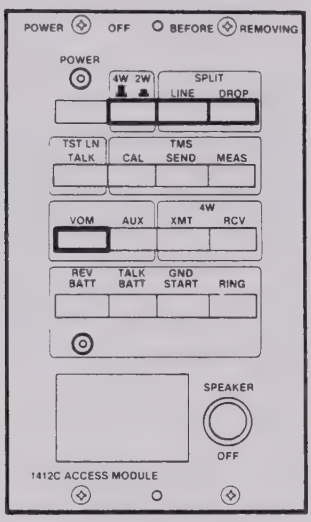


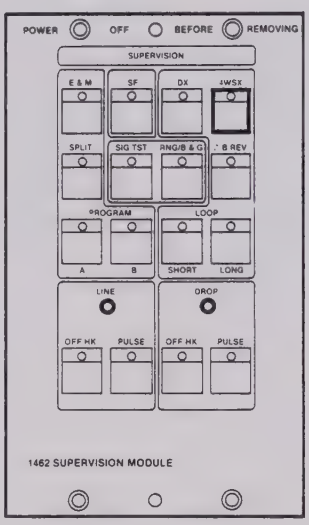


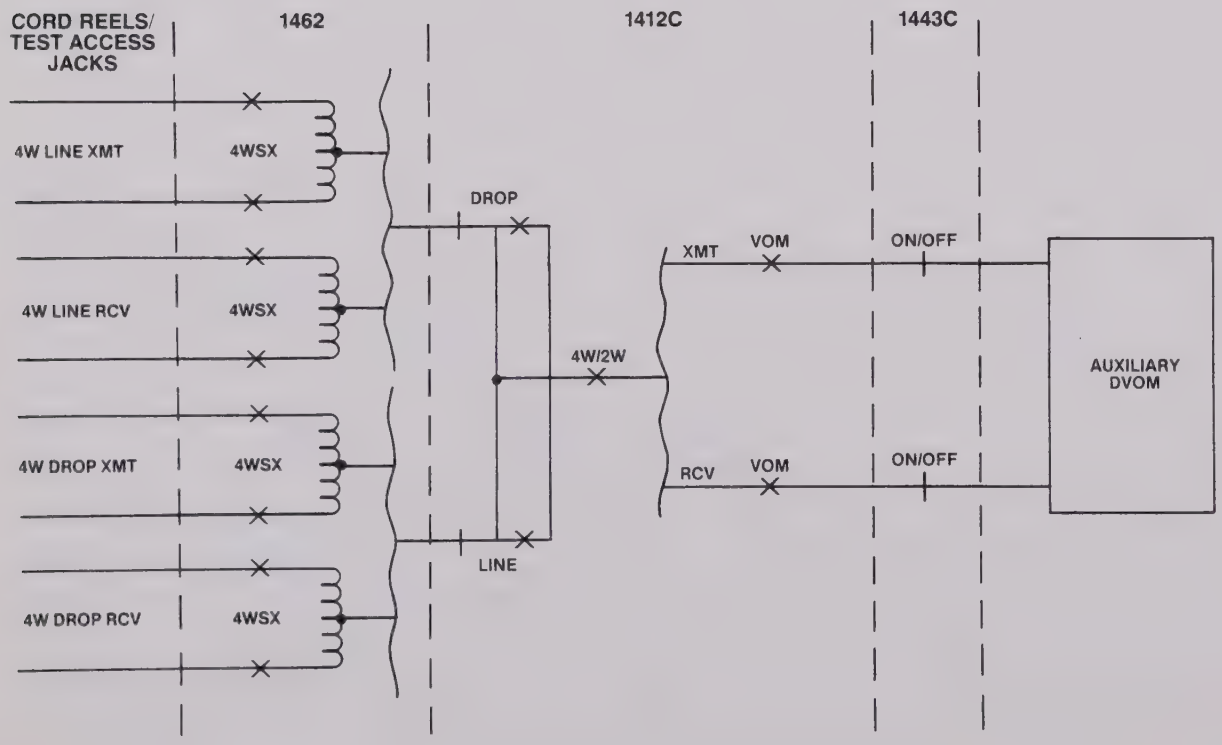
STEP	PROCEDURE
1	Perform Procedure 26 "Four Wire Simplex VOM Test—Voltage Measurement" for both ac and dc voltage and for the transmit/receive pair circuit to be selected below. *Caution: If any ac or dc voltage is measured, DO NOT continue with capacitive kick test.*
2	Release all 1443C buttons except **ON/OFF**.
3	Press the 1443C **RX10K** button.
4	Press the 1443C **T** or **R** button to select transmit or receive pair to ground respectively. If neither button is pressed, test will be between transmit and receive pairs.
5	When the 1443C meter stabilizes, press or release the 1443C **REV/CAP** button while observing the meter. The meter will deflect to the right (downscale) and then return to a stable reading.
6	Repeat Step 5 as often as necessary to get a good capacitance indication.

PROCEDURE 29
FOUR WIRE SIMPLEX VOM TEST—VOLTAGE, RESISTANCE, AND CAPACITANCE MEASUREMENT ON AUXILIARY DVOM

This procedure is used to measure ac/dc voltage, resistance, and capacitance on a four-wire simplex circuit, using an auxiliary DVOM. The auxiliary DVOM may be hardwired into the 1400 Test Facility, or connected via patch cords to the Test Facility Test Access Jackfield.



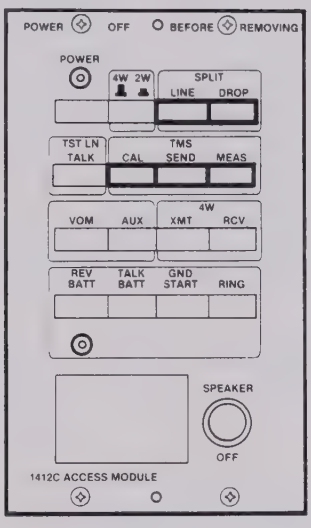


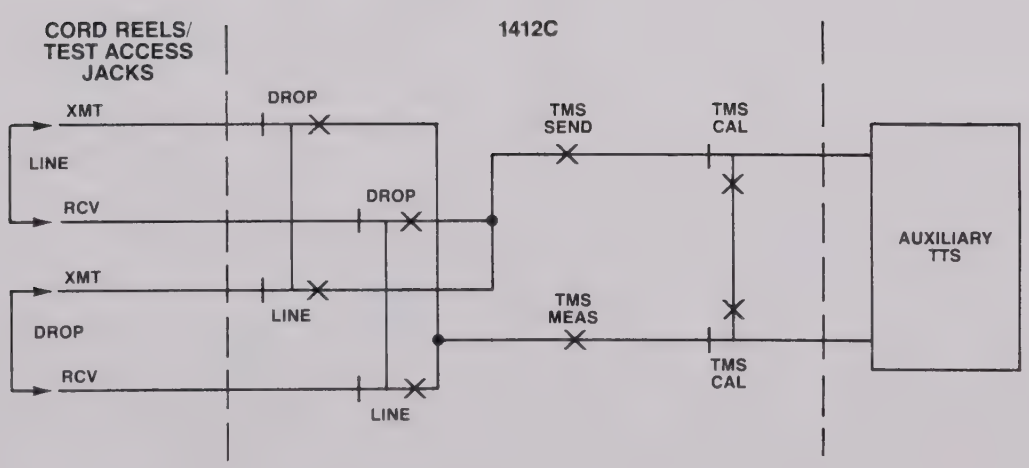


STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	If the auxiliary DVOM is not hardwired into the Test Facility, connect the DVOM input to the **AUX DVOM** jack on the Test Access Jackfield.
3	Ensure the accessed circuit is idle (see Procedure 19 if necessary). *Caution: Always measure ac and dc voltage on a circuit before measuring resistance or capacitance. Measurement of resistance or capacitance on a circuit with voltage present may damage the DVOM.* *Note:* Refer to the DVOM User Manual as necessary in performing the following steps.
4	Select an appropriate ac or dc voltage range at the DVOM.
5	Select the desired transmit pair-to-receive pair, transmit pair-to-ground, or receive pair-to-ground voltage measurement conditions at the DVOM.
6	Press the 1462 **4W SX** button (**4W SX** indicator lit).
7	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed.
8	Press the 1412C **4W/2W** and **VOM** buttons, and observe the DVOM meter for voltage reading. *Caution: Continue below only if zero voltage is measured for all transmit pair/receive pair/ground conditions.*
9	Select the desired resistance and capacitance ranges and transmit lead/receive lead/ground conditions at the DVOM, and observe the DVOM meter for readings. *Note:* Measured capacitance must be adjusted for the capacitance of any terminating equipment.

PROCEDURE 30
FOUR WIRE TRANSMISSION TEST

This procedure is used to transmit a test tone over a four-wire line transmit or drop receive pair to a remote Transmission Test Set (TTS), or to receive and measure a test tone over a four-wire line receive or drop transmit pair from a remote TTS or office milliwatt. If the line or drop transmit and receive pairs are jumpered together at the remote end, a test tone can be sent on one pair, and returned on the other for measurement. Tones are sent and measured at the 1400 Test Facility by means of an auxiliary TTS connected to the Test Facility. The auxiliary TTS may be hardwired into the 1400 Test Facility, or connected via patch cords to the Test Facility Test Access Jackfield.

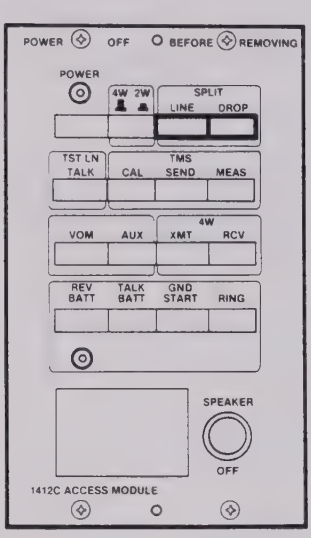


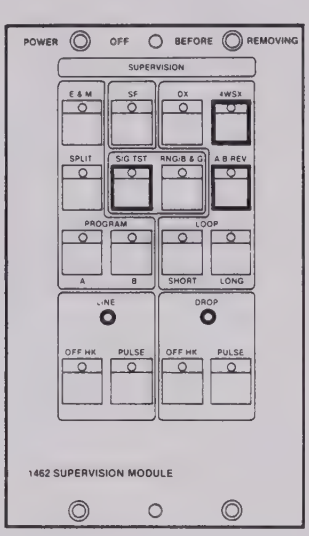


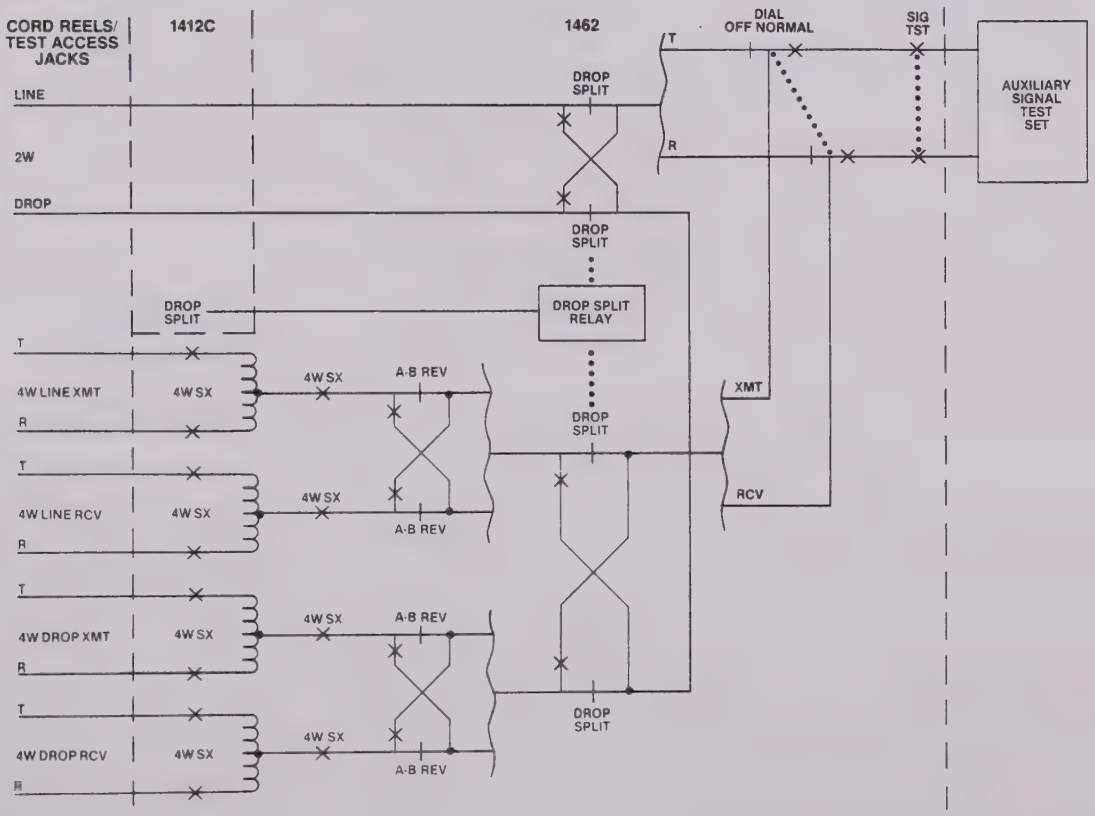
STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	Ensure the accessed circuit is idle (see Procedure 19 if necessary). *Note:* Refer to the TTS User Manual as necessary in performing the following steps.
3	Connect the auxiliary TTS to the TTS jacks in the Test Facility Test Access Jackfield (if not already wired into the Test Facility).
4	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed.
5	Select the desired TTS oscillator and measurement parameters.
6	If TTS oscillator output is to be measured before connecting to an accessed circuit: (a) Press the 1412C **TMS CAL** button. (b) Read the output signal level and frequency on the TTS display panel. (c) Release the 1412C **TMS CAL** button.
7	To send a test tone on the accessed circuit line transmit or drop receive pair, press the 1412C **TMS SEND** button.
8	To receive and measure a test tone on the accessed circuit line receive or drop transmit pair, press the 1412C **TMS MEAS** button. Observe the TTS display panel for readings.
9	To send a test tone on the accessed circuit line transmit or drop receive pair, and to receive it for measurement on the accessed circuit line receive or drop transmit pair: (a) Have the accessed circuit transmit and receive pairs jumpered together at the far end. (b) Press the 1412C **TMS SEND** and **MEAS** buttons. (c) Observe the TTS display panel for readings.

PROCEDURE 31
FOUR WIRE SIMPLEX SIGNAL TEST—SEND OR MEASURE LOOP/B & G PULSES

This procedure is used to send continuous loop or battery and ground (B & G) pulses on a four-wire simplex circuit, or to measure loop and B & G pulses received on a four-wire simplex circuit. Pulses are sent and measured by means of an auxiliary signal test set connected to the Test Facility, and pulse characteristics sent and measured are dependent upon the capabilities of the signal test set used. The auxiliary test set may be hardwired into the Test Facility or patched to the Test Facility Test Access Jackfield.



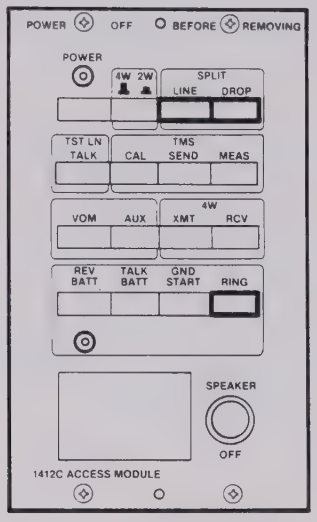


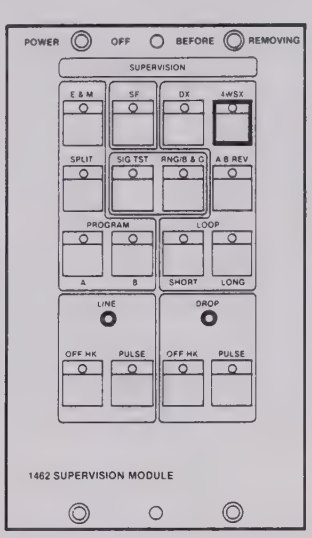


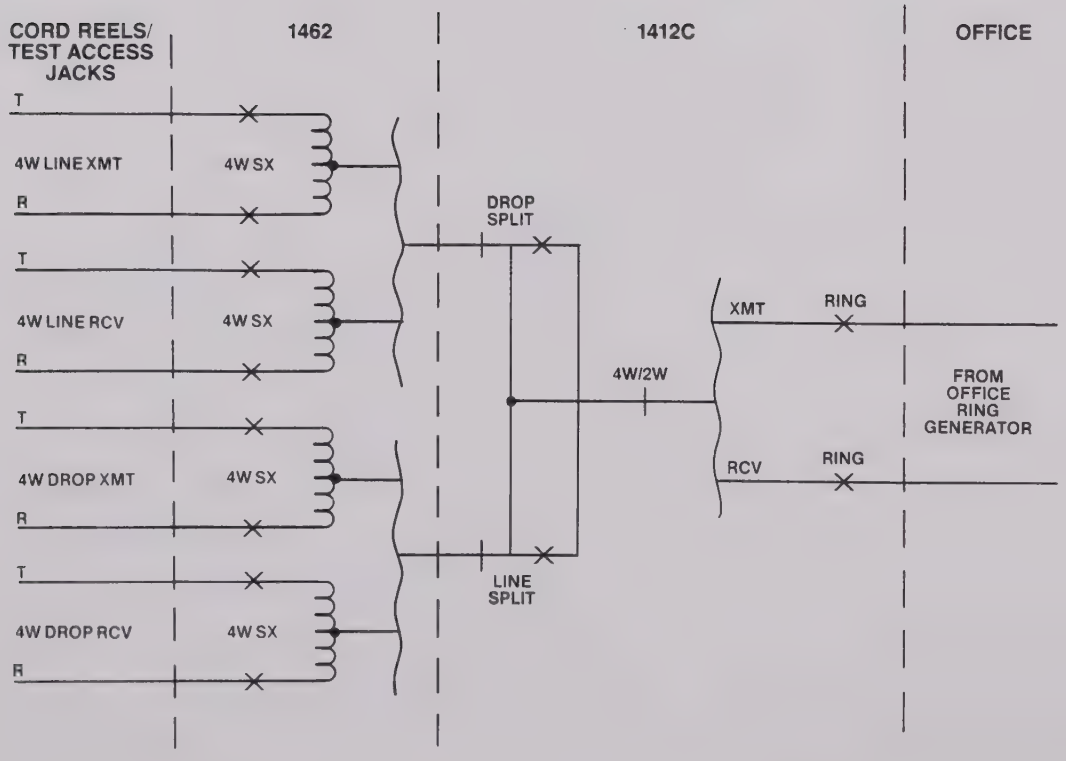
STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	Ensure the accessed circuit is idle (see Procedure 19 if necessary).
3	If the auxiliary signal test set is not hardwired into the Test Facility, connect the signal test set input and output to the respective **SIG TST RCV** and **SND** jacks on the Test Access Jackfield.
4	Press the 1462 **4W SX** button (**4W SX** indicator lit).
5	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed.
6	Select the desired loop or B & G pulse generation or measurement conditions at the signal test set. Refer to the signal test set user manual as necessary.
7	Press the 1462 **SIG TST** button (**SIG TST** indicator lit) to send or measure loop/B & G signaling.

PROCEDURE 32
FOUR WIRE SIMPLEX SIGNALING—SEND RINGING SIGNAL

This procedure is used to send the office ringing signal over a split four-wire simplex circuit.



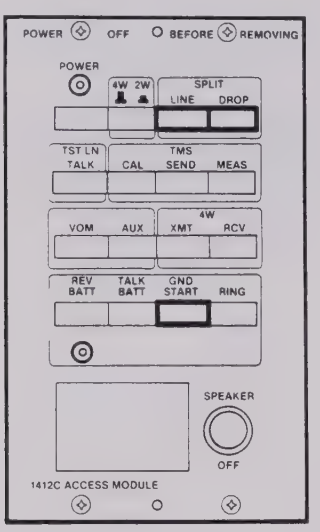


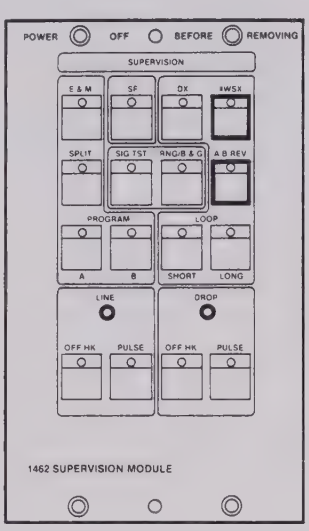


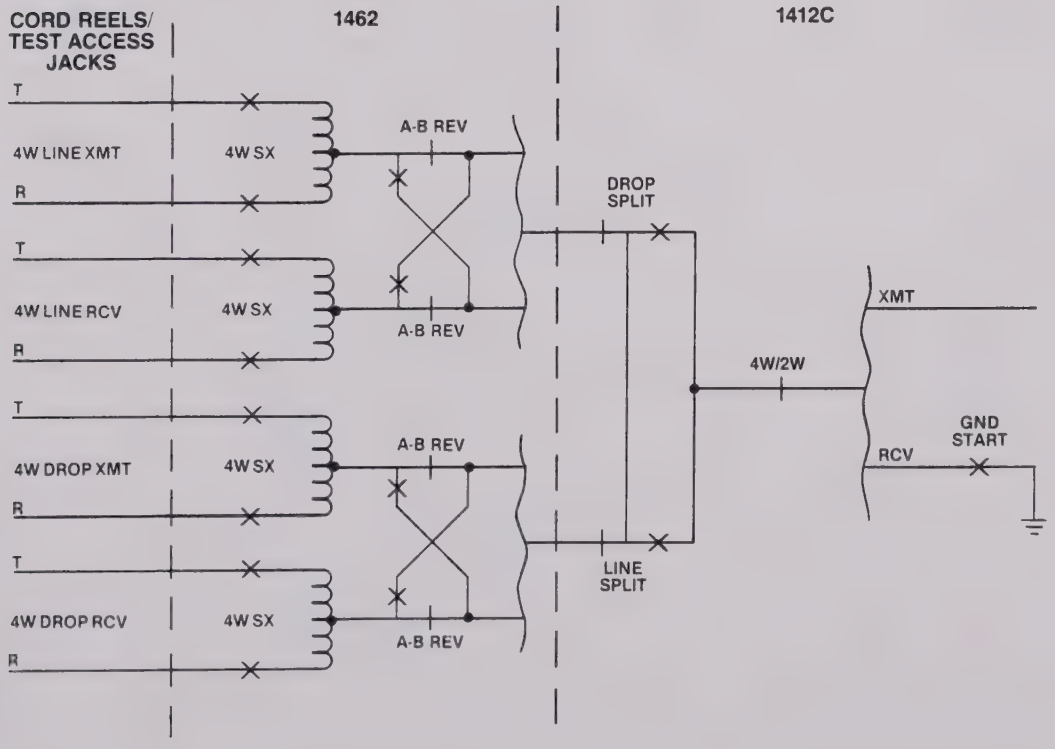
STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit on which ringing will be sent.
2	Ensure the accessed circuit is idle (see Procedure 19 if necessary).
3	Press the 1462 **4W SX** button (**4W SX** indicator lit).
4	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the ringing signal is to be sent.
5	Press the 1412C **RING** button to send the ringing signal. The signal will be sent as long as the button is held pressed.

PROCEDURE 33
FOUR WIRE SIMPLEX SIGNALING—SEND GROUND START

This procedure is used to seize PBX trunks by applying a momentary ground to the receive pair of a split four-wire simplex circuit. Application of the ground actuates the line relay in the central office.



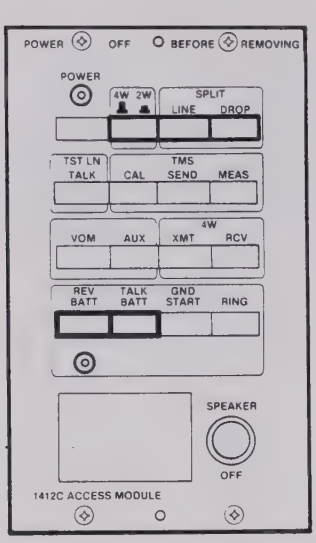


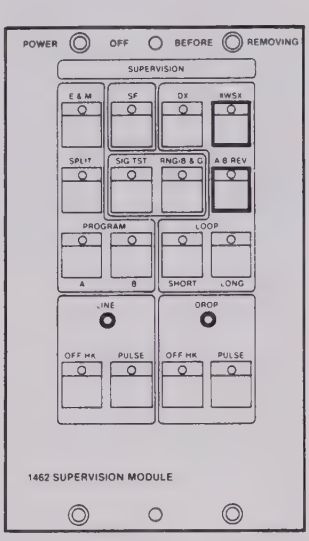


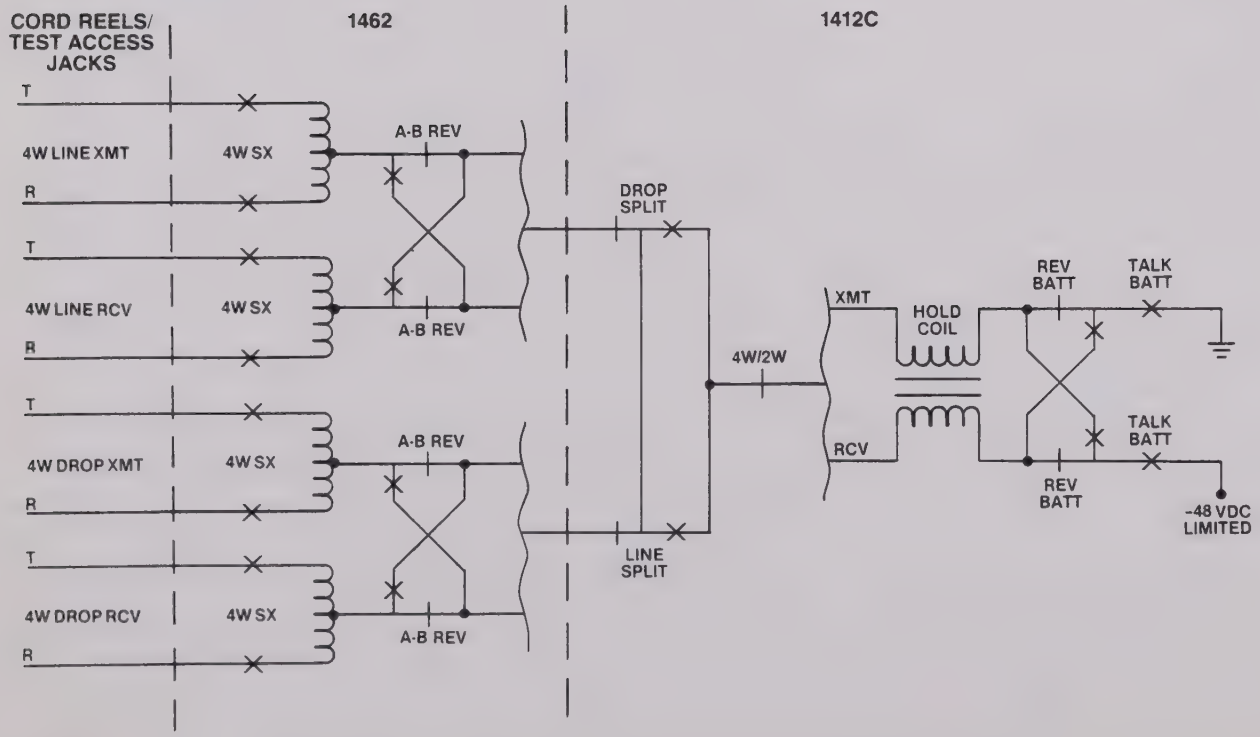
STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be signaled.
2	Ensure the accessed circuit is idle (see Procedure 19 if necessary).
3	Press the 1462 **4W SX** button (**4W SX** indicator lit).
4	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which ground start is to be sent.
5	Press the 1412C **GND START** button. Hold pressed as long as necessary to seize the trunk. *Note:* Ground start may be applied to the transmit pair instead of the receive pair by pressing the 1462 **A-B REV** button (**A-B REV** indicator lit), and then the 1412C **GND START** button.

PROCEDURE 34
FOUR WIRE SIMPLEX TALK BATTERY—SEND

This procedure is used to send –48 Vdc talk battery on a split four-wire simplex circuit.



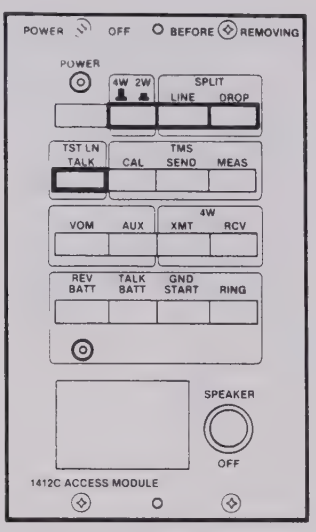


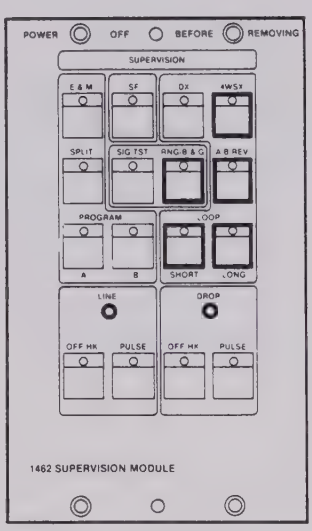


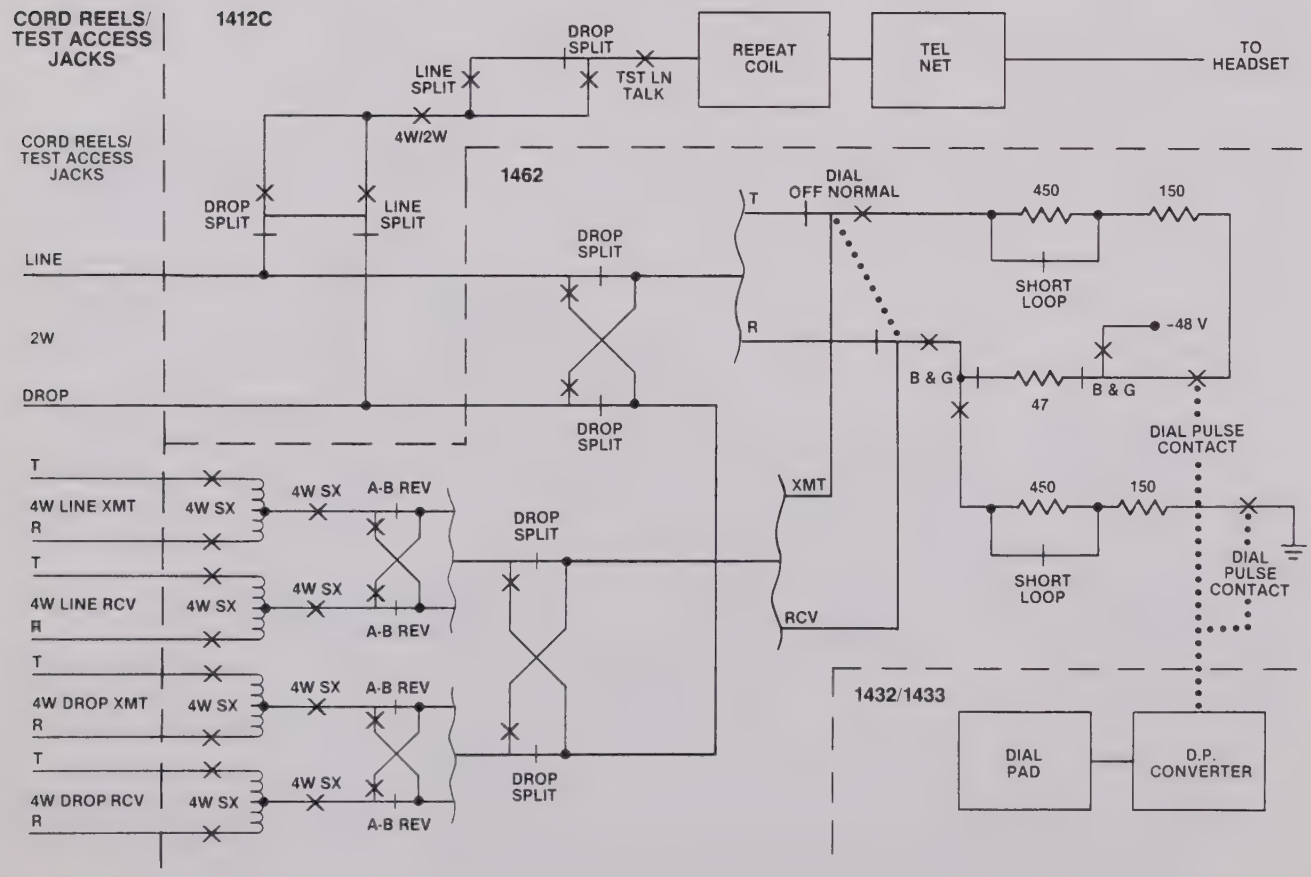
STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit on which talk battery will be sent.
2	Ensure the accessed circuit is idle (see Procedure 19 if necessary).
3	Press the 1462 **4W SX** button (**4W SX** indicator lit).
4	Press the 1412C **REV BATT** button to allow correct operation of the 1412C **REV BATT** indicator.
5	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which talk battery is to be sent.
6	Select the desired talk battery polarity with the 1462 **A-B REV** button as follows: (a) Button pressed—Ground to transmit pair, talk battery to receive pair. (b) Button released—Ground to receive pair, talk battery to transmit pair.
7	Press the 1412C **TALK BATT** button to send talk battery.

PROCEDURE 35
FOUR WIRE SIMPLEX LOOP/B & G SIGNALING

This procedure is used for simplex signaling on a four-wire circuit accessed via a 1462 Supervision Module through the Cord Reel Panel or Test Access Jackfield. Signaling may be long or short loop or B & G, on either the line or drop side. Talking is possible via headset after the circuit is dialed up.



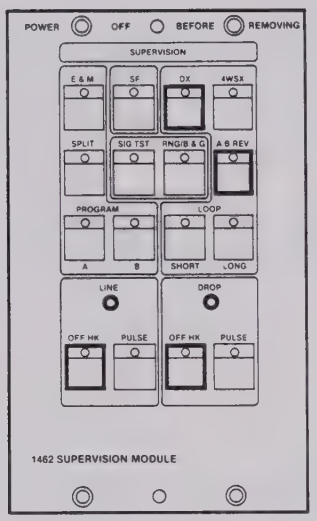


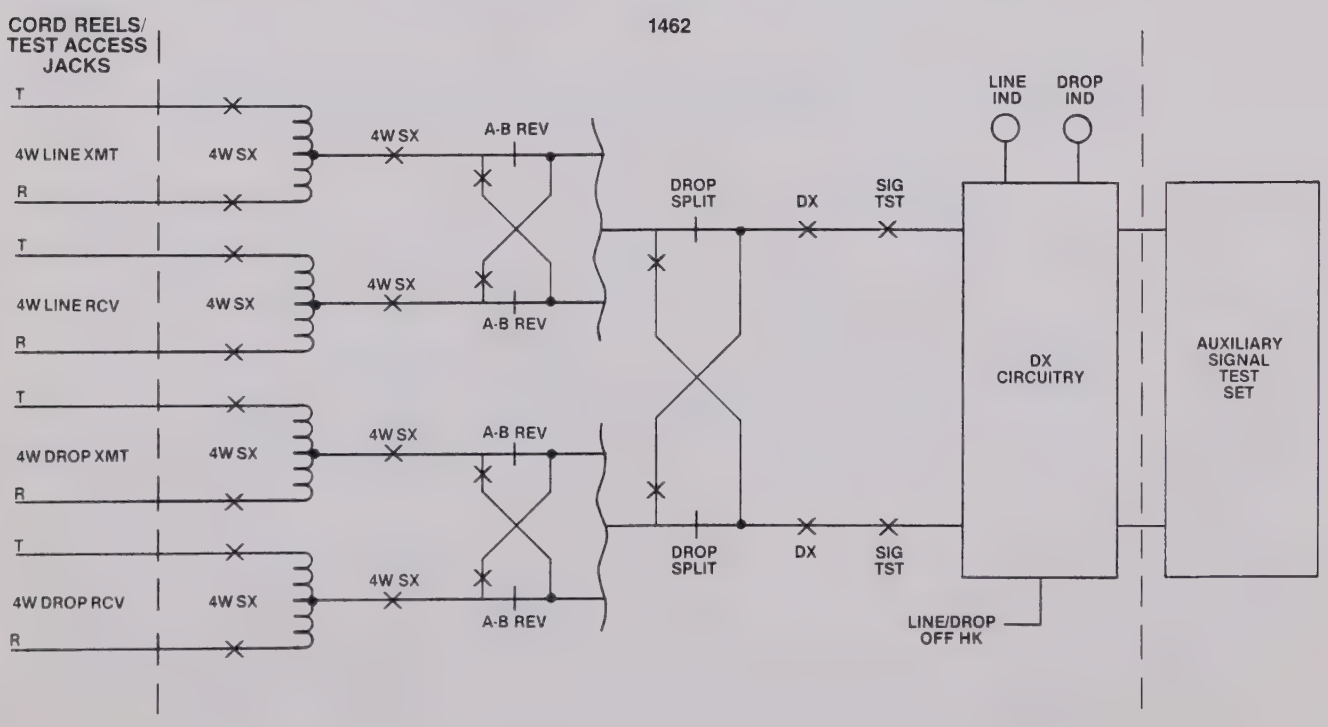


STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be dialed.
2	Press the 1462 **4W SX** button (**4W SX** indicator lit).
3	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side to be dialed.
4	If battery and ground (B & G) signaling is required, press the 1462 **RNG-B & G** button (**RNG-B & G** and **LONG LOOP** indicators lit).
5	If reverse simplex B & G signaling is required (battery to receive pair, ground to transmit pair), press the 1462 **A-B REV** button (**A-B REV** indicator lit). If **A-B REV** indicator is not lit, B & G signaling will be normal (battery to transmit pair, ground to receive pair).
6	Select long or short loop signaling as follows: (a) Signaling in Loop Mode: (1) Long Loop—Press the 1462 **LONG LOOP** button (**LONG LOOP** indicator lit). (2) Short Loop—Press the 1462 **SHORT LOOP** button (**LONG LOOP** indicator not lit). (b) Signaling in B & G Mode: (1) Long Loop—Press the 1462 **LONG LOOP** button (**LONG LOOP** indicator lit). *Note:* Long loop is automatically selected with selection of B & G Mode, or can be reselected after selection of short loop. (2) Short Loop—Press the 1462 **SHORT LOOP** button (**SHORT LOOP** indicator lit).
7	At the 1422 Communication Module(s), release or place on hold all active telephone lines. Refer to Procedure 42 if necessary.
8	Select one of the following dialing modes, and perform the corresponding procedure to dial out on the accessed circuit. The indicated 1432 or 1433 Signal Module is required for each dialing mode. (a) Manual DP Mode (1432 or 1433)—Procedure 45. (b) Manual DP, TT, or MF Mode with Last Number Recall (1432 or 1433)—Procedure 46. (c) Store and Forward DP, TT, or MF Mode (1432 or 1433)—Procedure 47. (d) Abbreviated Recall DP, TT, or MF Mode (1432)—Procedure 48.
9	Press the 1412C **4W/2W** and **TST LN TALK** buttons to talk on the circuit via headset.

PROCEDURE 36
FOUR WIRE DUPLEX SIGNAL TEST—MONITOR/MEASURE PULSES

This procedure is used to monitor four-wire duplex circuit conditions, and to measure pulses received on a four-wire duplex circuit. Pulses are measured by means of an auxiliary signal test set connected to the Test Facility, and pulse characteristics measured are dependent upon the capabilities of the signal test set used. The auxiliary test set may be hardwired into the Test Facility or patched to the Test Facility Test Access Jackfield.

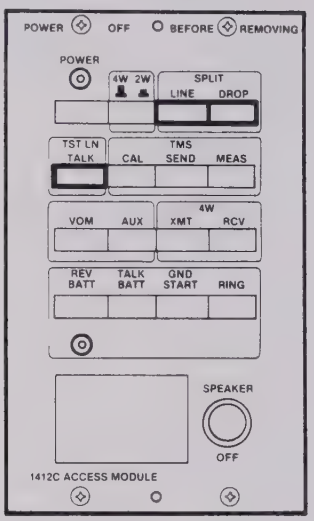


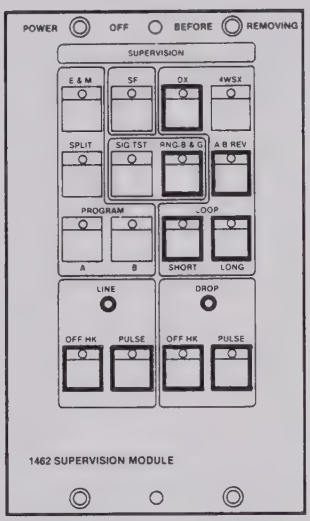


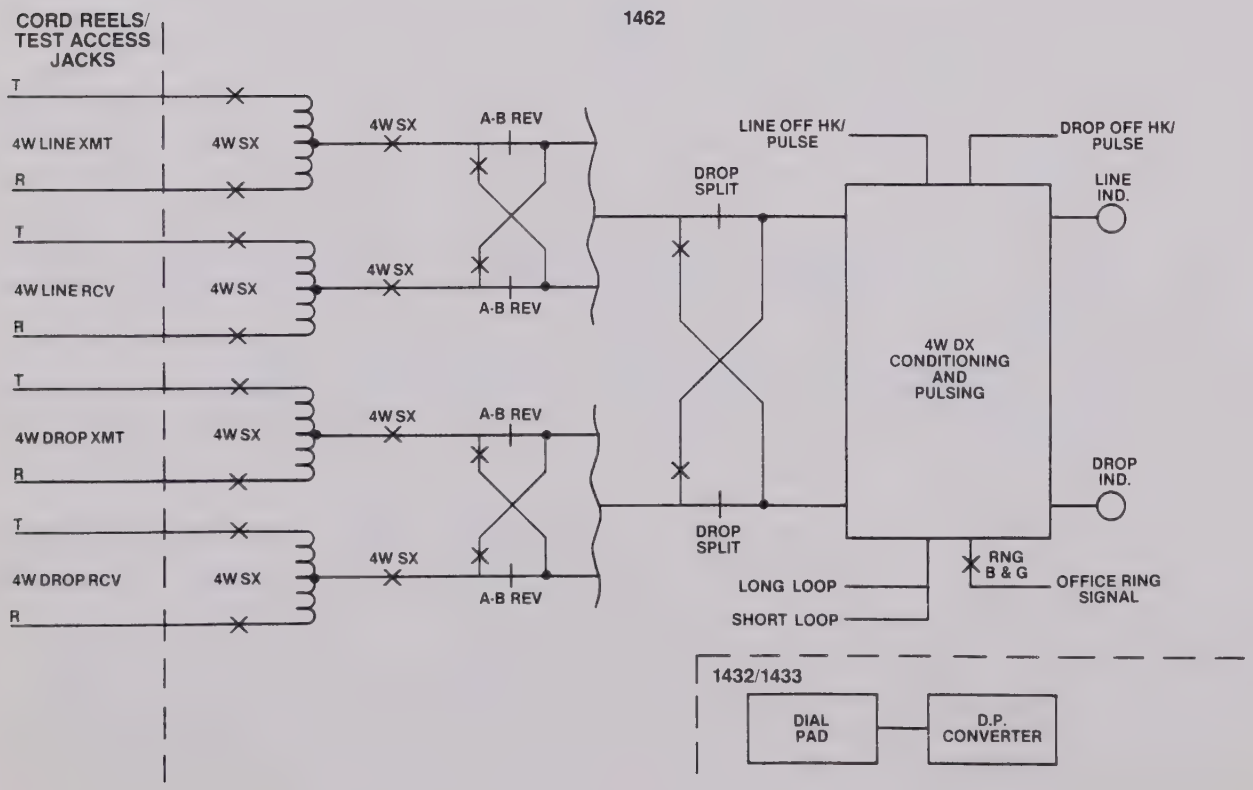
STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jack to the access jacks for the circuit to be tested.
2	If the auxiliary signal test set is not hardwired into the Test Facility, connect the signal test set input and output to the respective **SIG TST RCV** and **SND** jacks on the Test Access Jackfield.
3	Press the 1462 **DX** button (**DX** and **LONG LOOP** indicators lit).
4	If reverse simplex lead **DX** testing is required, press the 1462 **A-B REV** button (**A-B REV** indicator lit).
5	Select the required loop balance condition at the 1462 by pressing/releasing the **LONG** and/or **SHORT LOOP** buttons to give one of the following loop selection indications: (a) Open loop—Neither the **LONG** nor **SHORT LOOP** indicator lit. (b) 3000 ohm loop—**LONG LOOP** indicator lit, and **SHORT LOOP** indicator not lit. (c) 1000 ohm loop—**SHORT LOOP** indicator lit, and **LONG LOOP** indicator not lit. (d) 0 ohm loop—Both **LONG** and **SHORT LOOP** indicators lit.
6	Ensure that the accessed circuit is idle (see Procedure 19 if necessary).
7	When the circuit is idle, press the 1462 **LINE** or **DROP OFF HK** button to take the circuit to be tested off hook (**LINE** or **DROP OFF HK** indicator lit).
8	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side on which the test is to be performed.
9	Observe the corresponding 1462 **LINE** or **DROP** indicator for circuit status as follows: (a) Lit—Accessed circuit is on-hook (idle). (b) Not lit—Accessed circuit is off-hook (busy). (c) Flashing—Accessed circuit is signaling.
10	Select E & M pulse measurement mode at the signal test set. Refer to the signal test set user manual as necessary.
11	Press the 1462 **SIG TST** button (**SIG TST** indicator lit), and observe the signal test set for pulse measurement.

PROCEDURE 37
FOUR WIRE DUPLEX SIGNALING

This procedure is used for DX signaling on a four-wire simplex circuit accessed via a 1462 Supervision Module through the Cord Reel Panel or Test Access Jackfield. DX on-hook, off-hook, and pulsing conditions can be sent on either the line or drop side, and balance can be provided for loops of 0, 1000, or 3000 ohms, or open circuit. Incoming on-hook, off-hook, and pulsing conditions can be monitored after the circuit is split.







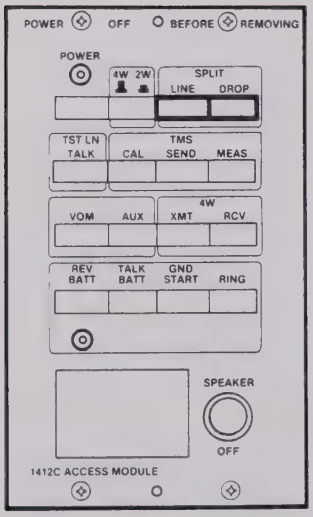
STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be signaled.
2	Press the 1462 **DX** button (**DX** and **LONG LOOP** indicators lit).
3	If reverse simplex lead DX monitoring or signaling is required, press the 1462 **A-B REV** button (**A-B REV** indicator lit).
4	Select the required loop balance condition at the 1462 by pressing/releasing the **LONG** and/or **SHORT LOOP** buttons to give one of the following loop selection indications: (a) Open loop—Neither the **LONG** nor **SHORT LOOP** indicator lit. (b) 3000 ohm loop—**LONG LOOP** indicator lit, and **SHORT LOOP** indicator not lit. (c) 1000 ohm loop—**SHORT LOOP** indicator lit, and **LONG LOOP** indicator not lit. (d) 0 ohm loop—Both **LONG** and **SHORT LOOP** indicators lit.
5	Ensure that the accessed circuit is idle (see Procedure 19 if necessary).
6	When the circuit is idle, press the 1462 **LINE** or **DROP OFF HK** button to take the circuit to be signaled off hook (**LINE** or **DROP OFF HK** indicator lit).
7	Press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side to be signaled.
8	Observe the corresponding 1462 **LINE** or **DROP** indicator for circuit status as follows: (a) Lit—Accessed circuit is on-hook (idle). (b) Not lit—Accessed circuit is off-hook (busy). (c) Flashing—Accessed circuit is signaling.
9	Press the 1462 **LINE** or **DROP PULSE** button to enable signaling on the selected circuit (**LINE** or **DROP PULSE** indicator lit).
10	At the 1422 Communication Module(s), release or place on hold all active telephone lines. Refer to Procedure 42 if necessary.
11	Select one of the following signal modes, and perform the corresponding procedure to signal on the accessed circuit. For dialing modes, the indicated 1432 or 1433 Signal Module is required. (a) Direct circuit ringing—Press the 1462 **RNG-B & G** button. Ringing signal will be sent as long as the button is held pressed. (b) Dialing in Manual DP Mode (1432 or 1433)—Procedure 45. (c) Dialing in Manual DP, TT, or MF Mode with Last Number Recall (1432 or 1433)—Procedure 46. (d) Dialing in Store and Forward DP, TT, or MF Mode (1432 or 1433)—Procedure 47. (e) Dialing in Abbreviated Recall DP, TT, or MF Mode (1432)—Procedure 48.
12	Press the 1412C **TST LN TALK** button to talk on the circuit via headset.

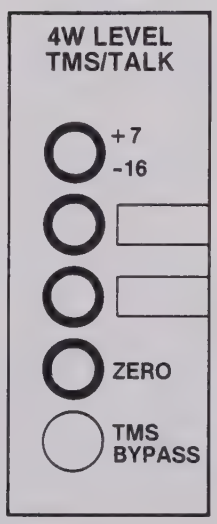
PROCEDURE 38
FOUR WIRE SF SIGNAL TEST—MONITOR/MEASURE SIGNALING

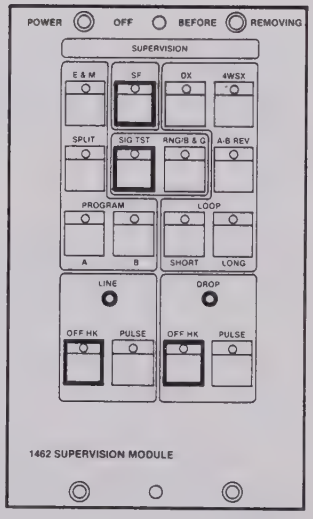
This procedure is used to monitor four-wire SF circuit conditions, and to measure signaling received on a four-wire SF circuit. There are four selectable preset level ranges available from + 10 dBm to any of four levels selected in the -19 dBm to -47 dBm range. The selectable level ranges are adjustable using procedures outlined in the Calibration Section. Signaling is measured by means of an auxiliary signal test set connected to the Test Facility, and signal characteristics measured are dependent upon the capabilities of the signal test set used. The auxiliary test set may be hardwired into the Test Facility or patched to the Test Facility Test Access Jackfield.

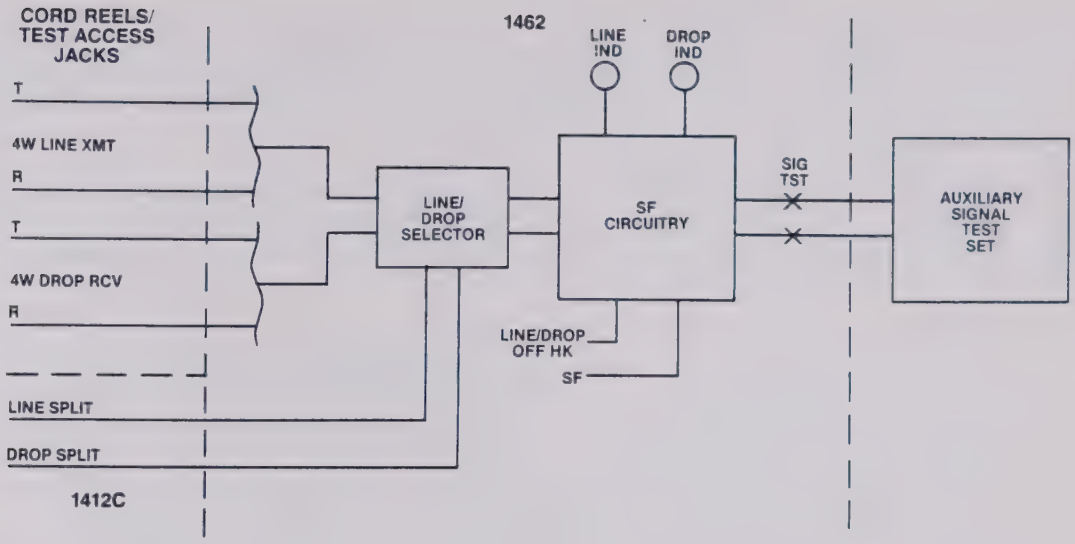
Note: This procedure can be performed only if the SF function was ordered as part of the 1462 Supervision Module (1462 "B" version), and Model 8972 4W Level TMS/Talk Module is incorporated into the 1412C Module. Without the 8972 Module, the sensitivity threshold levels are factory set from + 10 dBm to the levels for the type of 1412C Module used.

TYPE 1412C	RCV LINE	XMT DROP
1412C with +7/-16 dBm level coordination	-24 dBm	-47 dBm
1412C with 0/0 dBm level coordination	-31 dBm	-31 dBm
Note: The levels may be changed by adjusting potentiometers R5 for RCV LINE and R2 for XMT DROP. See Page 4-12 of the Calibration Section, for location of potentiometers.		









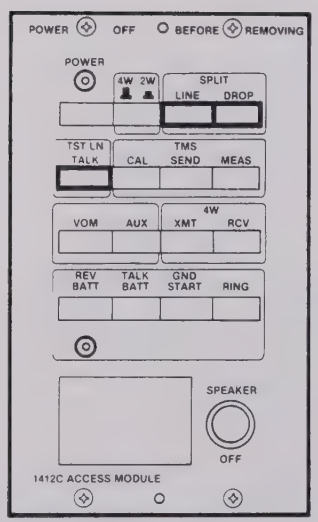
STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be tested.
2	If the auxiliary signal test set is not hardwired into the Test Facility, connect the signal test set input and output to the respective **SIG TST RCV** and **SND** jacks on the Test Access Jackfield.
3	Press the 1462 **SF** button (**SF** indicator lit).
4	Observe the 1462 **LINE** and **DROP** indicators for circuit status as follows: (a) Lit—Accessed circuit is on-hook (idle). (b) Not lit—Accessed circuit is off-hook (busy). (c) Flashing—Accessed circuit is signaling.
5	When the circuit is idle, press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side to be tested.
6	Press the 1462 **LINE** or **DROP OFF HK** button to take the circuit to be tested off hook (**LINE** or **DROP OFF HK** indicator lit).
7	For selectable TLP, only available with the 8972 4W Level TMS/Talk Module, (if not available, skip step 7), press **S1**, **S2**, **S3** or **S4** button on the 8972 for desired level threshold.
8	Select E & M measurement mode at the signal test set. Refer to the signal test set user manual as necessary.
9	Press the 1462 **SIG TST** button (**SIG TST** indicator lit), and observe the signal test set for signal measurement.

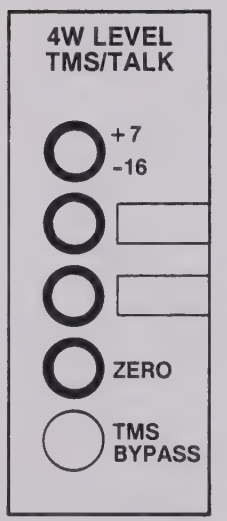
PROCEDURE 39
FOUR WIRE SF SIGNALING

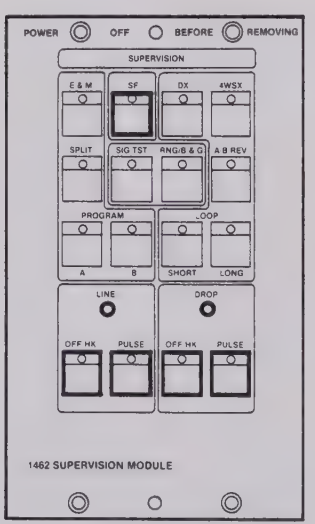
This procedure is used to signal on a split four-wire circuit equipped for SF signaling. Four selectable preset transmit levels for conditioning and pulsing line transmit and drop receive pairs are automatically selected and controlled by the 1462 Supervision and 8972 4W Level TMS/Talk Modules. The transmit levels are adjusted using procedures outlined in the Calibration Section.

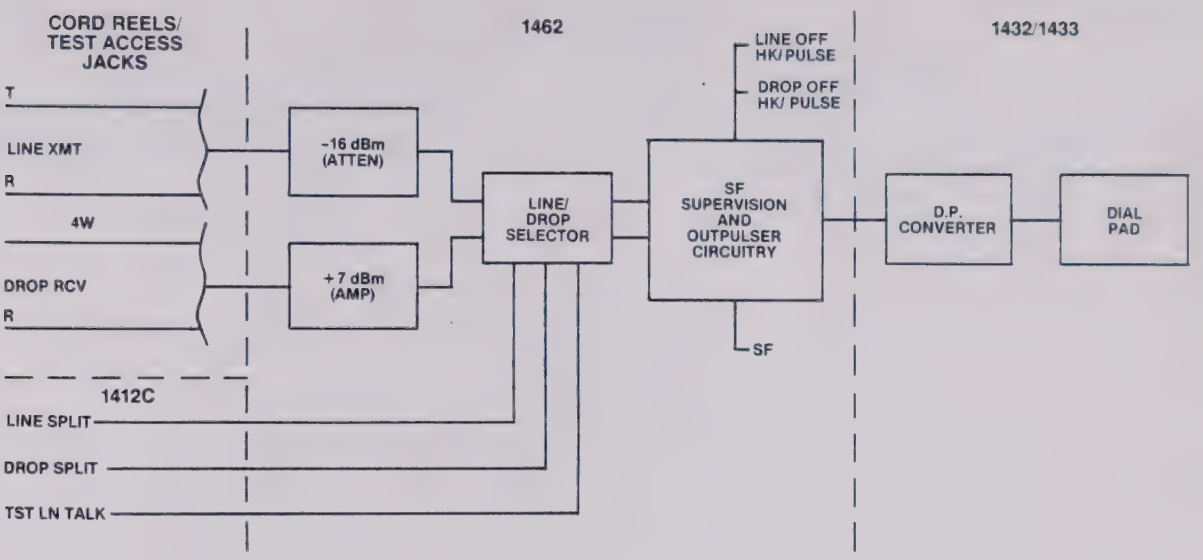
Note: This procedure can be performed only if the SF function was ordered as part of the 1462 Supervision Module (''B'' version) and Model 8972 4W Level TMS/Talk Module is incorporated into the 1412C Module. Without the 8972 Module, standard transmit levels are factory set for the type of 1412C Module used.

TYPE 1412C	RCV DROP		XMT LINE	
	ON-HOOK	PULSE	ON-HOOK	PULSE
With +7/-16 dBm level coordination	-13 dBm	-1 dBm	-36 dBm	-24 dBm
With 0/0 dBm level coordination	-20 dBm	-8 dBm	-20 dBm	-8 dBm
Note: The levels may be changed by adjusting potentiometers R6 for RCV DROP and R3 for XMT LINE. See Page 4-12 of the Calibration Section, for location of potentiometers.				





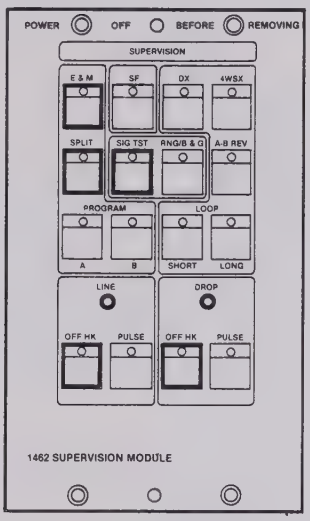


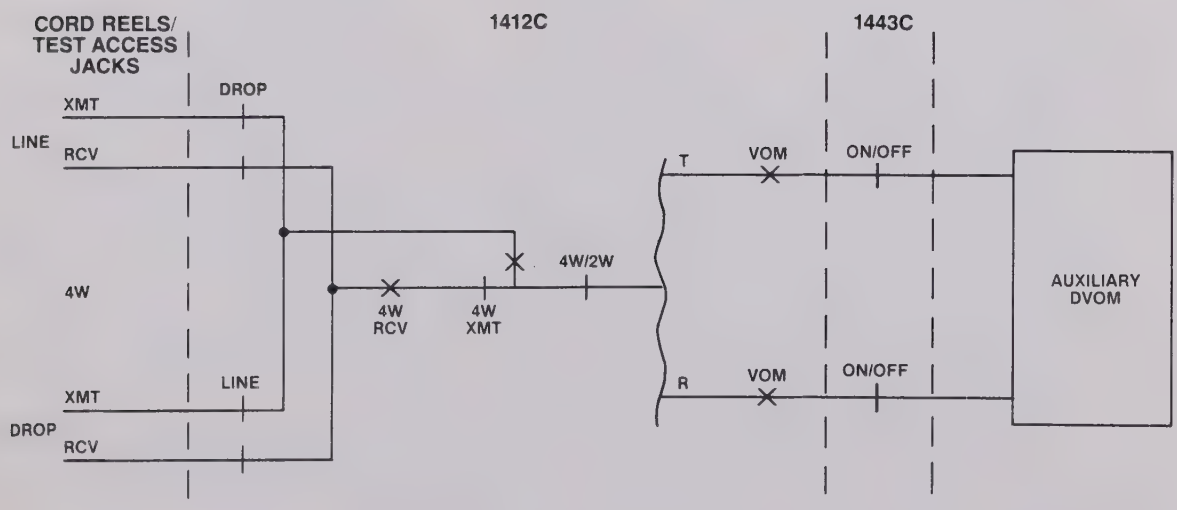


STEP	PROCEDURE
1	Connect the **4W LINE** and **DROP** test cords/jacks to the access jacks for the circuit to be signaled.
2	Press the 1462 **SF** button (**SF** indicator lit).
3	Observe the 1462 **LINE** and **DROP** indicators for circuit status as follows: (a) Lit—Accessed circuit is on-hook (idle). (b) Not lit—Accessed circuit is off-hook (busy). (c) Flashing—Accessed circuit is signaling.
4	When the circuit is idle, press the 1412C **LINE** or **DROP SPLIT** button corresponding to the side to be signaled.
5	Press the 1462 **LINE** or **DROP OFF HK** button to take the circuit to be signaled off hook (**LINE** or **DROP OFF HK** indicator lit).
6	At the 1422 Communication Module(s), release or place on hold all active telephone lines. Refer to Procedure 42 if necessary.
7	Press the 1462 **LINE** or **DROP PULSE** button to enable signaling on the selected circuit (**LINE** or **DROP PULSE** indicator lit).
8	For selectable TLP, only available with the 8972 4W Level TMS/Talk Module, (if not available skip step 8), press **S1**, **S2**, **S3** or **S4** button on the 8972 for the desired SF level (SF will be 20 dB below TLP).
9	Select one of the following signal modes, and perform the corresponding procedure to signal on the accessed circuit. For dialing modes, the indicated 1432 or 1433 Signal Module is required. (a) Direct circuit ringing—Press the 1462 **RNG-B & G** button. Ringing signal will be sent as long as the button is held pressed. (b) Dialing in Manual DP Mode (1432 or 1433)—Procedure 45. (c) Dialing in Manual DP, TT, or MF Mode with Last Number Recall (1432 or 1433)—Procedure 46. (d) Dialing in Store and Forward DP, TT, or MF Mode (1432 or 1433)—Procedure 47. (e) Dialing in Abbreviated Recall DP, TT, or MF Mode (1432)—Procedure 48.
10	Press the 1412C **TST LN TALK** buton to talk on the circuit via headset.

PROCEDURE 40
E & M SIGNAL TEST—MONITOR/MEASURE PULSES

This procedure is used to monitor E & M circuit conditions and to measure pulses on the Line E and Drop M leads. Pulses are measured by means of an auxiliary signal test set connected to the Test Facility, and pulse characteristics measured are dependent upon the capabilities of the signal test set used. The auxiliary test set may be hardwired into the Test Facility or patched to the Test Facility Test Access Jackfield.

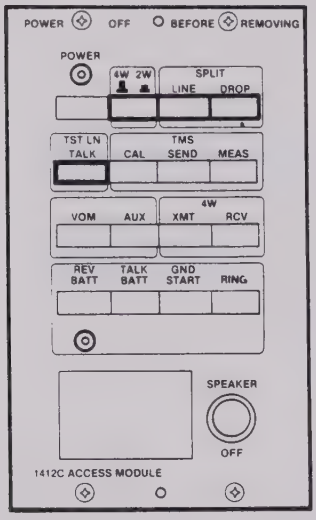


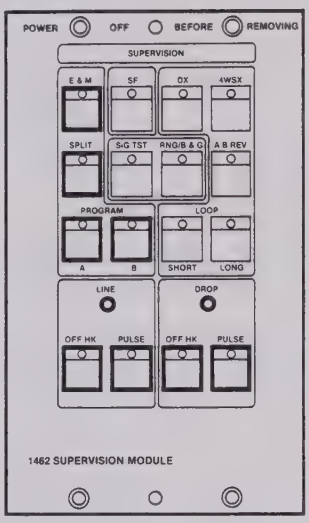


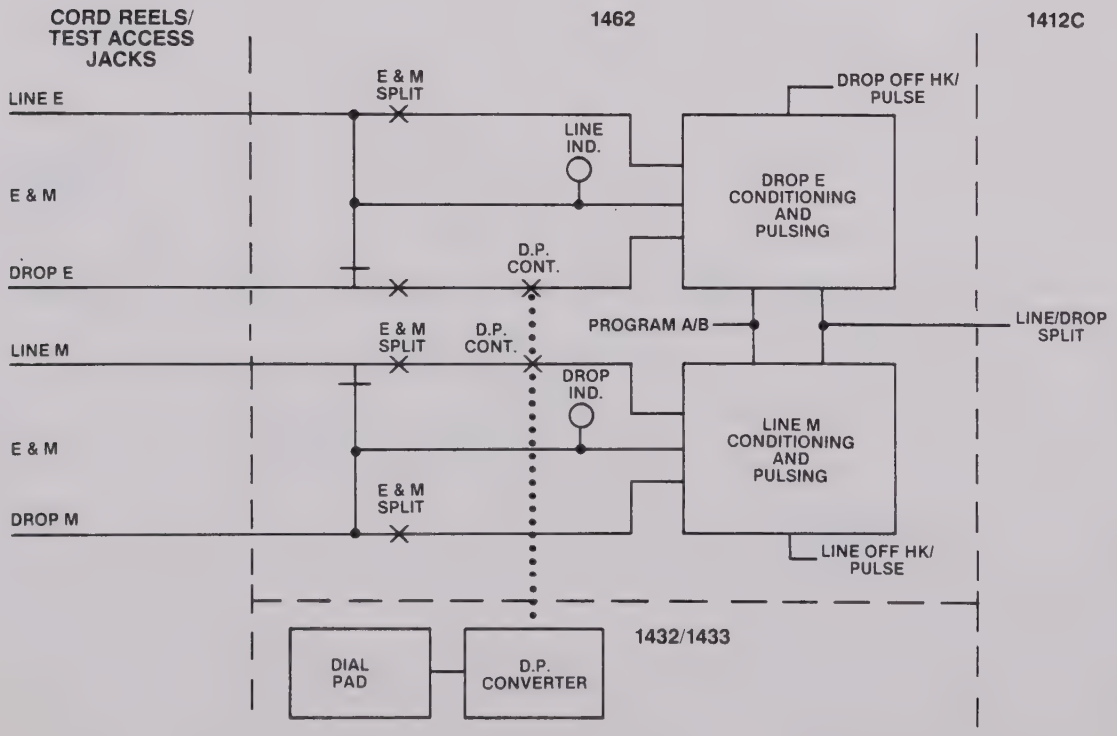
STEP	PROCEDURE
1	Connect the **E & M** test cords/jacks to the access jacks for the circuit to be tested.
2	If the auxiliary signal test set is not hardwired into the Test Facility, connect the signal test set input and output to the respective **SIG TST RCV** and **SND** jacks on the Test Access Jackfield.
3	Observe the 1462 **LINE** and **DROP** indicators for circuit status as follows: (a) Lit—Accessed circuit is on hook (idle). (b) Not lit—Accessed circuit is off hook (busy). (c) Flashing—Accessed circuit is signaling.
4	Select the desired E & M pulse measurement conditions at the signal test set. Refer to the signal test set user manual as necessary. *Note:* The auxiliary signal test set tip is connected to the Line E lead, and signal test set ring is connected to the Drop M lead.
5	Press the 1462 **LINE OFF HK** button (if measuring pulses on the drop side) or **DROP OFF HK** button (if measuring on the line side) to seize the circuit.
6	Press the 1462 **SIG TST** button (**SIG TST** indicator lit).
7	Press the 1462 **E & M** and **SPLIT** buttons (**E & M** and **SPLIT** indicators lit), and observe the signal test set for pulse measurement.

PROCEDURE 41
E & M SIGNALING

This procedure is used to signal and talk on a two or four-wire circuit equipped for E & M signaling. Signaling may be one of three selectable types depending on circuit requirements. The E & M types available for selection were established during Test Facility installation (refer to Volume 2).



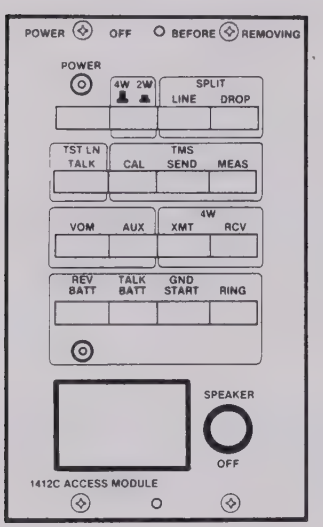


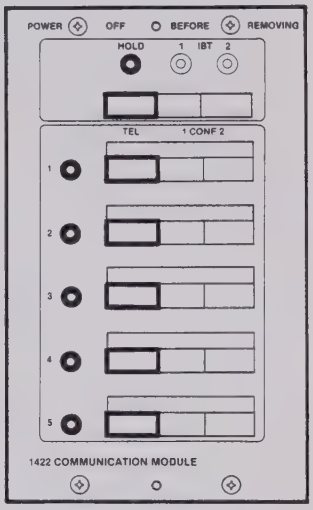


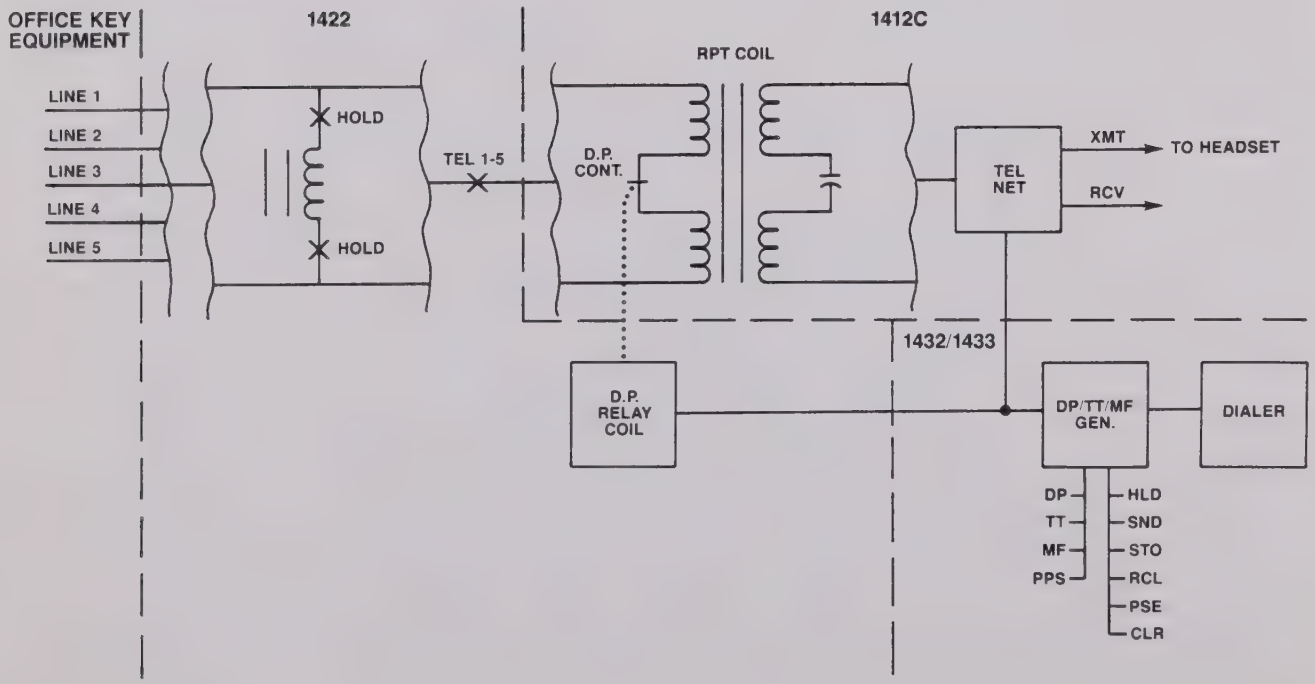
STEP	PROCEDURE
1	Connect the **E & M** test cords/jacks to the access jacks for the circuit to be signaled.
2	If talking is to take place on the circuit, connect the **2W** or **4W LINE** or **DROP** test cords/jacks to the voice access jacks for the circuit to be signaled.
3	Press the 1462 **E & M** button (**E & M** indicator lit).
4	Observe the 1462 **LINE** and **DROP** indicators for status of the circuit to be signaled: (a) Lit—Circuit is on-hook (idle). (b) Not lit—Circuit is off-hook (busy). (c) Flashing—Circuit is signaling.
5	When the circuit is idle, press the 1412C **LINE** or **DROP SPLIT** button corresponding to the direction to be signaled (necessary only if talking is to take place on the circuit).
6	Press the 1462 **PROGRAM A** or **B** button to select the type of E & M signaling to be used (**PROGRAM A** or **B** indicator lit). *Note:* Types of E & M signaling provided by the **PROGRAM A** and **B** buttons were preset during Test Facility installation. Refer to installation data for the type provided by each button.
7	Press the 1462 **LINE** or **DROP OFF HK** button corresponding to the direction to be signaled (**LINE** or **DROP OFF HK** indicator lit).
8	Press the corresponding 1462 **LINE** or **DROP PULSE** button to enable signaling on the circuit (**LINE** or **DROP PULSE** indicator lit).
9	Press the 1462 **SPLIT** button (**SPLIT** indicator lit).
10	At the 1422 Communication Module(s), release or place on hold all active telephone lines. Refer to Procedure 42 if necessary.
11	Select one of the following signal modes, and perform the corresponding procedure to signal on the accessed circuit. For dialing modes, the indicated 1432 or 1433 Signal Module is required. (a) Direct circuit ringing—Press the 1462 **RNG-B & G** button. Ringing signal will be sent as long as the button is held pressed. (b) Dialing in Manual DP Mode (1432 or 1433)—Procedure 45. (c) Dialing in Manual DP Mode with Last Number Recall (1432 or 1433)—Procedure 46. (d) Dialing in Store and Forward DP Mode (1432 or 1433)—Procedure 47. (e) Dialing in Abbreviated Recall DP Mode (1432)—Procedure 48.
12	Press the 1412C **4W/2W** button if talking is to take place on a two-wire circuit.
13	Press the 1412C **TST LN TALK** button to talk on the circuit via headset.

PROCEDURE 42
ORIGINATE, HOLD, AND TERMINATE A CALL

This procedure is used to originate a call, place the call on hold, pick up a line that is on hold, and drop a call.



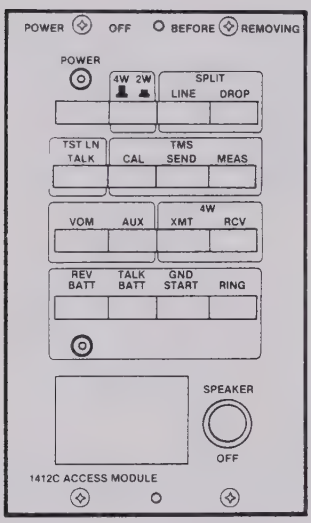


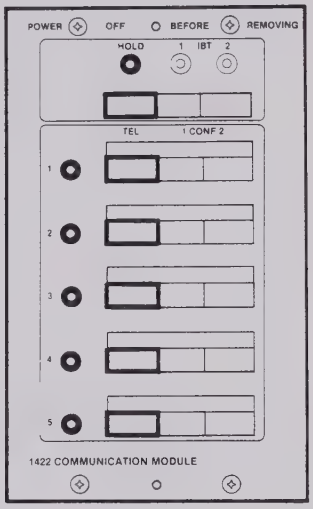


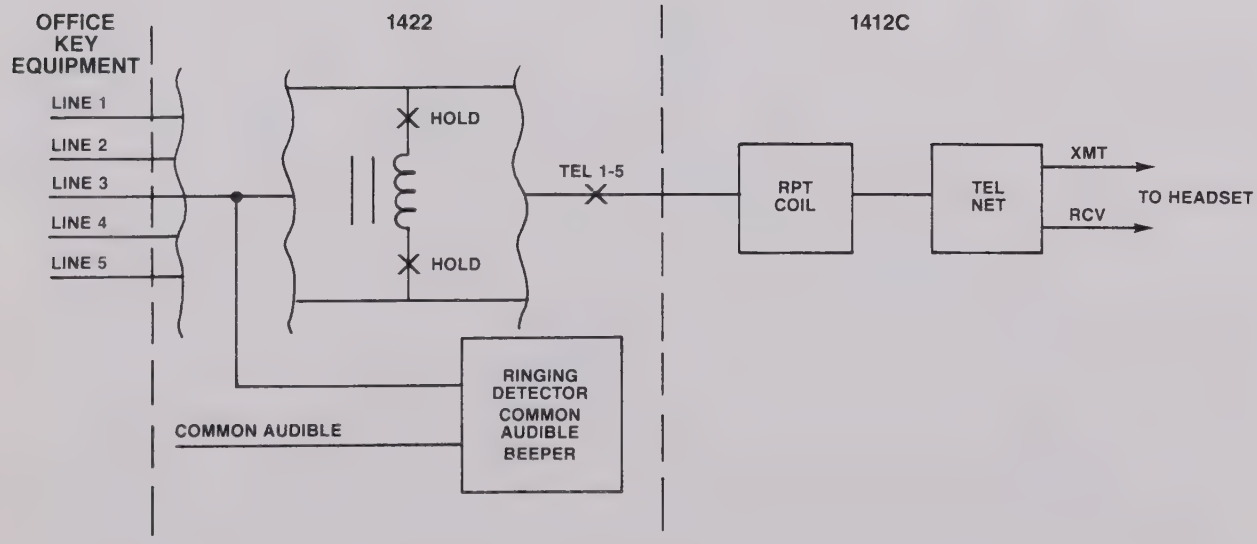
STEP	PROCEDURE
1	Plug a headset into the Test Facility headset jacks.
2	Press the 1422 **TEL** button for the line to be dialed. The corresponding **TEL** indicator will light, and dial tone will now be heard on the headset.
3	Select one of the following dialing modes, and perform the corresponding procedure to dial out on the accessed circuit. The indicated 1432 or 1433 Signal Module is required for each dialing mode. (a) Manual DP Mode (1432 or 1433)—Procedure 45. (b) Manual DP, TT, or MF Mode with Last Number Recall (1432 or 1433)—Procedure 46. (c) Store and Forward DP, TT, or MF Mode (1432 or 1433)—Procedure 47. (d) Abbreviated Recall DP, TT, or MF Mode (1432)—Procedure 48.
4	To place the call on hold: (a) Press the 1422 **HOLD** button to cause the **HOLD** indicator to flash. The **TEL** indicator for the line to be placed on hold will also flash. (b) Release the 1422 **TEL** button for the line to be placed on hold. The **TEL** indicator for the line on hold will continue to flash. The call is now on hold.
5	To pick up a line that is on hold, press the 1422 **TEL** button for the line to be removed from hold status. The corresponding indicator will light steady and talking on the circuit will again be possible via headset.
6	To disconnect the line from the 1422 Module, release the 1422 **TEL** button for the line to be disconnected. An on-hook condition is now presented on the disconnected line.

PROCEDURE 43
RECEIVE, HOLD, AND TERMINATE A CALL

This procedure is used to receive a call, place the call on hold, pick up a line that is on hold, and drop a call.



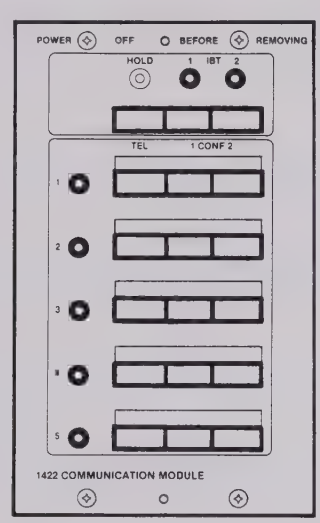


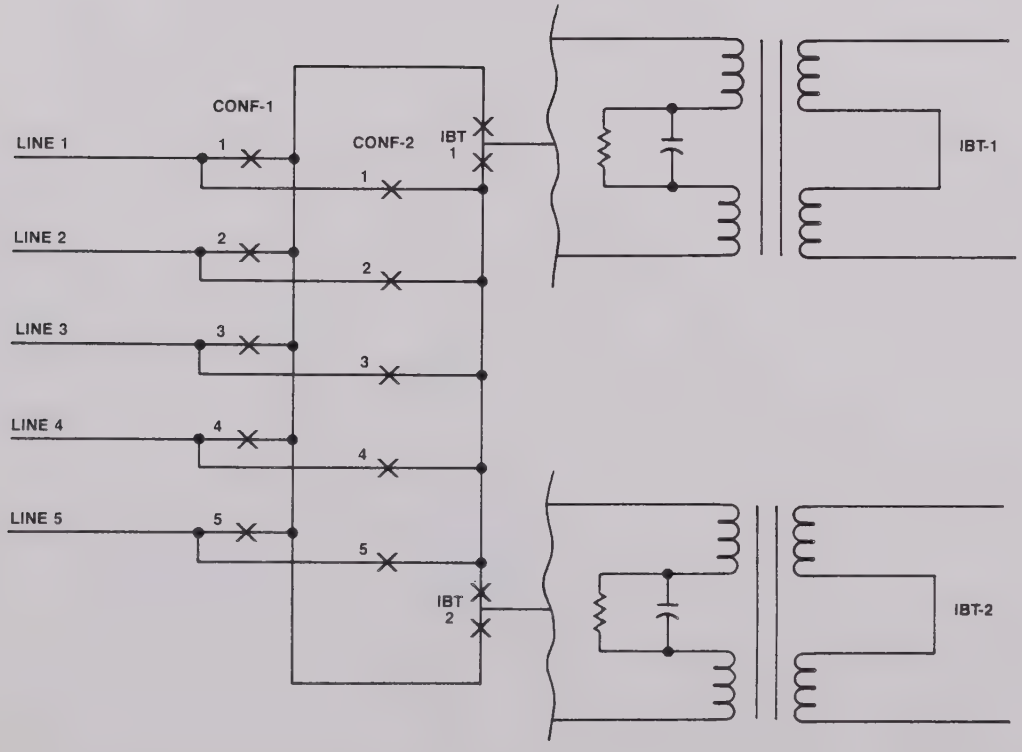


STEP	PROCEDURE
	Note: An incoming call will generate an audible signal in the 1422 Communication Module, and cause the corresponding 1422 front panel **TEL 1**, **2**, **3**, **4**, or **5** indicator to flash.
1	To answer a received call: (a) Plug a headset into the Test Facility headset jacks. (b) Press the 1422 **TEL** button corresponding to the flashing **TEL** indicator. The **TEL** indicator for the line will now light steady.
2	To place a received call on hold: (a) Press the 1422 **HOLD** button to cause the **HOLD** indicator to flash. The **TEL** indicator for the line to be placed on hold will also flash. (b) Release the 1422 **TEL** button for the line to be placed on hold. The **TEL** indicator for the line on hold will continue to flash. The call is now on hold.
3	To pick up a line that is on hold, press the 1422 **TEL** button for the line to be removed from hold status. The corresponding indicator will light steady, and talking on the circuit will again be possible via headset.
4	To disconnect the line from the 1422 Module, release the 1422 **TEL** button for the line to be disconnected. An on-hook condition is now presented on the disconnected line.

PROCEDURE 44
CONFERENCE CALLS

This procedure is used to conference two or more calls together or to an office interbay trunk.

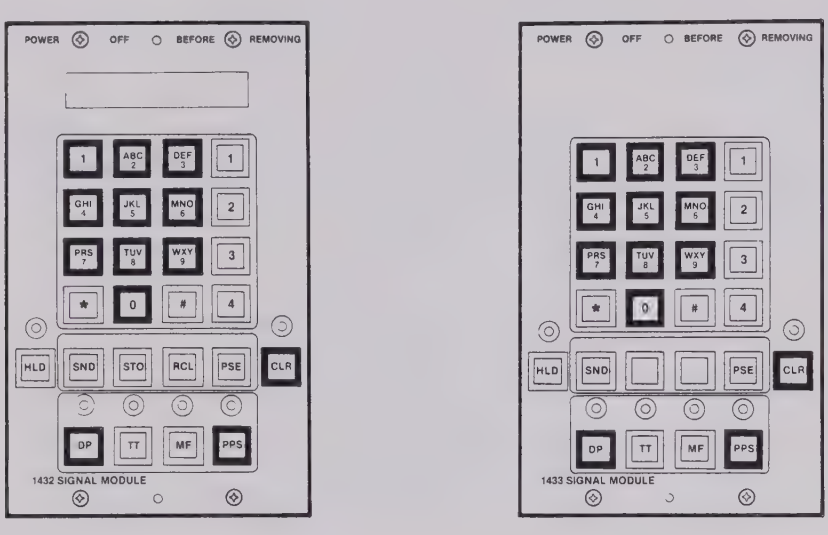




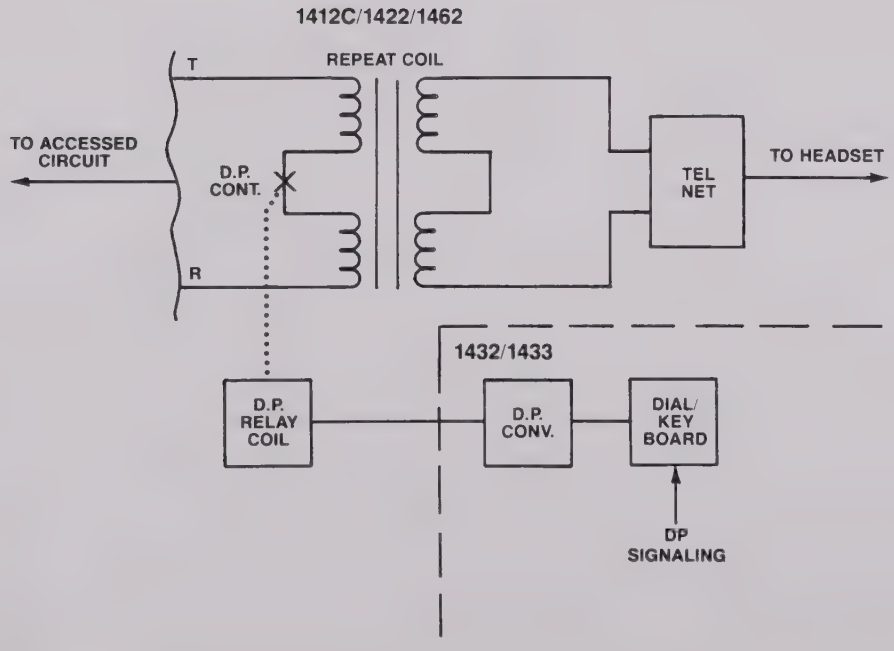
STEP	PROCEDURE
1	Originate or receive a call on one of the 1422 Communication Module telephone lines (refer to Procedure 42 or 43 as necessary).
2	Press the 1422 **CONF 1** or **CONF 2** button corresponding to the pressed **TEL** button.
3	Release the 1422 **TEL** button for the line to be conferenced.
4	Repeat steps 1, 2, and 3 for other lines to be conferenced. Lines can be conferenced to either or both of the 1422 **CONF** busses.
5	To conference the calls to an office interbay trunk, press the corresponding 1422 **IBT 1** or **2** button. Either or both of the 1422 **CONF** busses can be conferenced to either or both of the office interbay trunks wired to the Test Facility.
6	To remove lines from the conference: (a) Press the 1422 **TEL** button for each line conferenced. (b) Release the 1422 **IBT 1** and/or **2** buttons (if pressed). (c) Release the 1422 **CONF 1** and/or **2** buttons.
7	Release the 1422 **TEL** button for each line to be dropped from the 1422 Module.

PROCEDURE 45
DIALING IN MANUAL DP MODE

This procedure is used to dial a circuit using the Manual Dial Pulse (DP) Mode. The circuit to be dialed may be accessed by a 1412C Access Module, 1422 Communication Module, or 1462 Supervision Module.



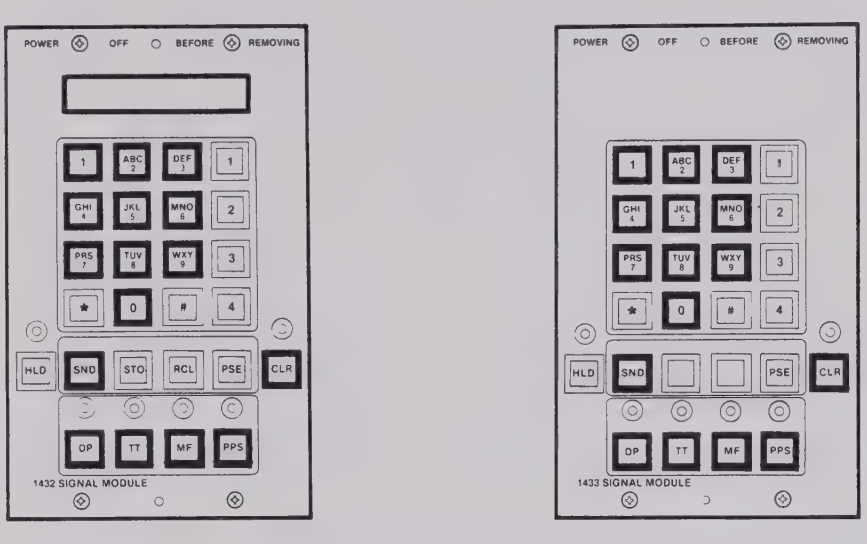
Either of these Signal Modules required (not both).



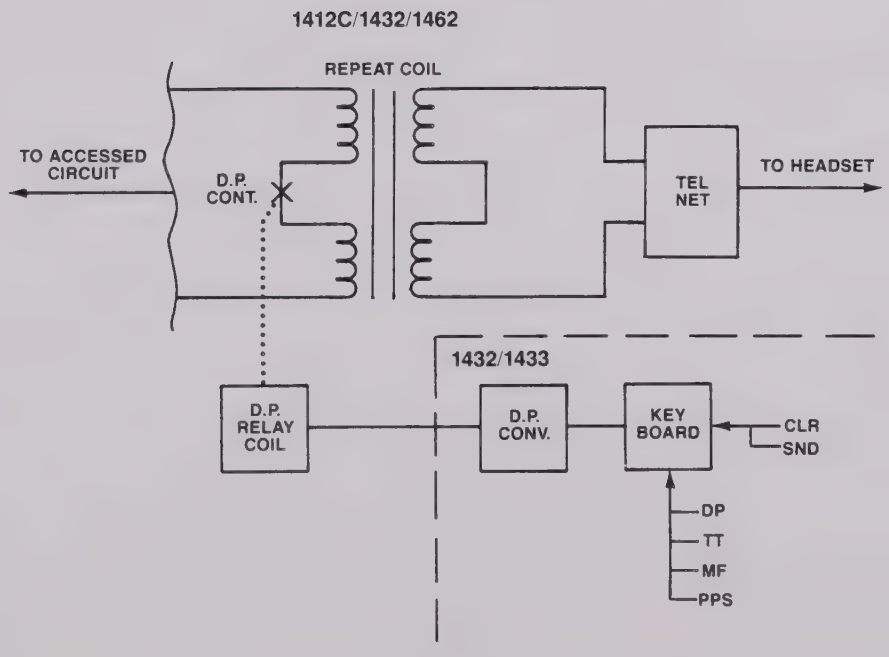
STEP	PROCEDURE
1	Perform one of the following procedures to access the circuit to be dialed: (a) Two-wire loop circuit—Procedure 15. (b) Two-wire loop/B & G circuit—Procedure 16. (c) Two-wire duplex circuit—Procedure 18. (d) Four-wire simplex loop/B & G circuit—Procedure 35. (e) Four-wire duplex circuit—Procedure 37. (f) Four-wire SF circuit—Procedure 39. (g) E & M circuit—Procedure 41. (h) Telephone line terminated at 1422 Module—Procedure 42.
2	Momentarily press the Signal Module **DP** button. The indicator above the **DP** button will light.
3	Momentarily press the Signal Module **PPS** button if fast signaling is desired. The indicator above the **PPS** button will light.
4	Momentarily press the Signal Module **CLR** button. The indicator above the **CLR** button will extinguish and on the 1432 Signal Module, the digital display will go dark.
5	Listen for dial tone in the headset, and dial the number on the Signal Module. After connection is completed, talking is possible via the headset.

PROCEDURE 46
DIALING IN MANUAL DP, TT, AND MF MODE WITH LAST NUMBER RECALL

This procedure is used to dial a circuit using the Manual DP, TT, and MF Mode with Last Number Recall. The circuit to be dialed may be accessed by a 1412C Access Module, 1422 Communication Module, or 1462 Supervision Module.



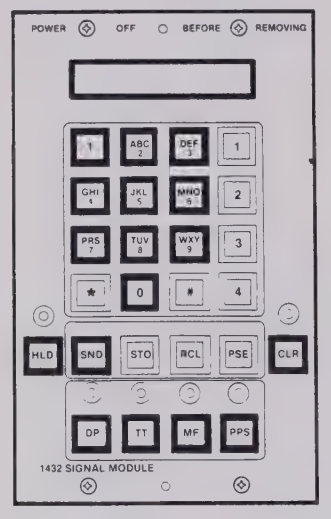
Either of these Signal Modules required (not both).

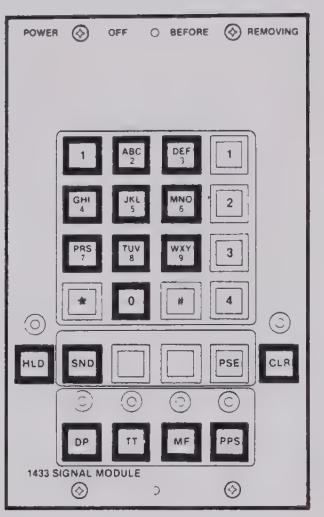


STEP	PROCEDURE
1	Perform one of the following procedures to access the circuit to be dialed: (a) Two-wire loop circuit—Procedure 15. (b) Two-wire loop/B & G circuit—Procedure 16. (c) Two-wire duplex circuit—Procedure 18. (d) Four-wire simplex loop/B & G circuit—Procedure 35. (e) Four-wire duplex circuit—Procedure 37. (f) Four-wire SF circuit—Procedure 39. (g) E & M circuit—Procedure 41. (h) Telephone line terminated at 1422 Module—Procedure 42.
2	Momentarily press the Signal Module **DP**, **TT** , or **MF** button for desired signaling mode. The indicator above the pressed button will light.
3	Momentarily press the Signal Module **PPS** button if fast signaling is desired. The indicator above the **PPS** button will light.
4	Momentarily press the Signal Module **CLR** button. The indicator above the **CLR** button will extinguish, and on the 1432 Signal Module, the digital display will go dark.
5	Listen for dial tone in the headset, and dial the number on the Signal Module dial pad. Each digit will be outpulsed as button is pressed.
6	If the connection is not completed, momentarily press the Signal Module **SND** button. The dialed number will be automatically outpulsed each time the **SND** button is pressed. *Note:* After connection is completed, talking is possible via headset.

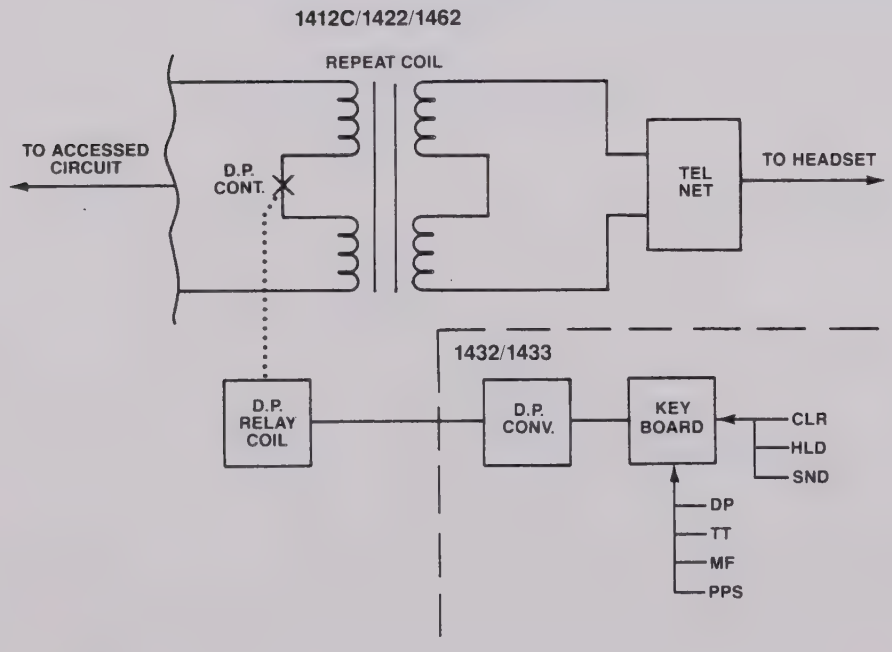
PROCEDURE 47
DIALING IN DP, TT, OR MF STORE AND FORWARD MODE

This procedure is used to dial a circuit using the DP, TT, or MF Store and Forward Mode. Outpulsing is inhibited until all digits of a telephone number have been entered into the dial pad. A number of up to 12 digits can be entered.





(Either of these signal modules required (not both).

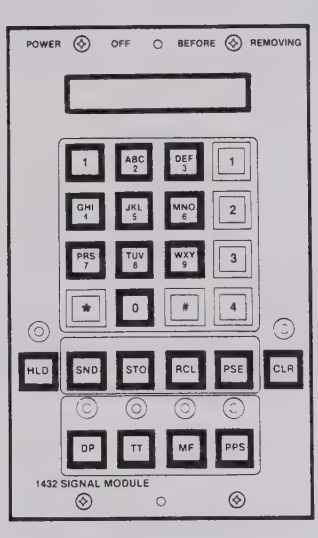


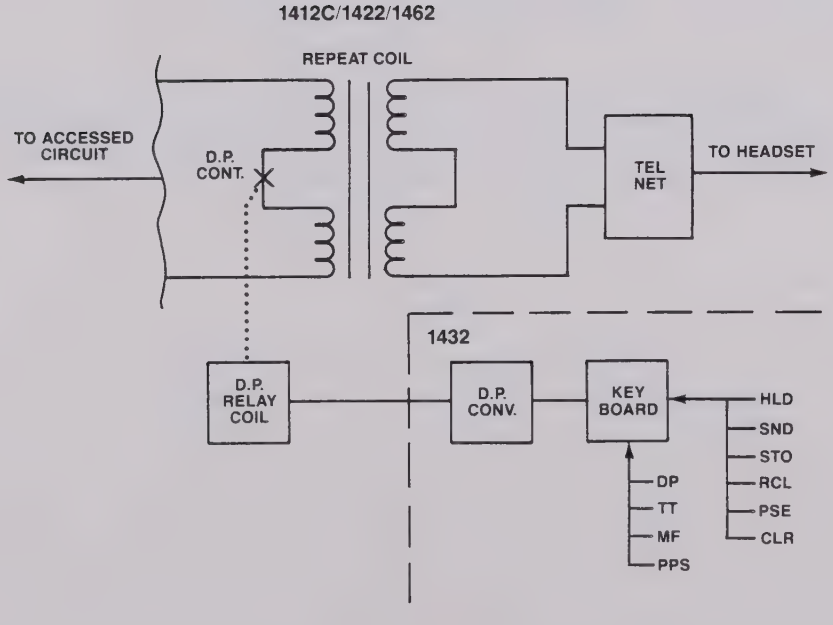
STEP	PROCEDURE
1	Perform one of the following procedures to access the circuit to be dialed: (a) Two-wire loop circuit—Procedure 15. (b) Two-wire loop/B & G circuit—Procedure 16. (c) Two-wire duplex circuit—Procedure 18. (d) Four-wire simpelx loop/B & G circuit—Procedure 35. (e) Four-wire duplex circuit—Procedure 37. (f) Four-wire SF circuit—Procedure 39. (g) E & M circuit—Procedure 41. (h) Telephone line terminated at 1422 Module—Procedure 42.
2	Momentarily press the Signal Module **DP**, **TT**, or **MF** button for the desired signaling mode. The indicator above the pressed button will light.
3	Momentarily press the Signal Module **PPS** button if fast signaling is desired. The indicator above the **PPS** button will light.
4	Momentarily press the Signal Module **CLR** button. The indicator above the **CLR** button will extinguish, and on the 1432, the digital display will go dark.
5	Press the Signal Module **HLD** button to enable storage of a telephone number and inhibit outpulsing.
6	Enter the desired telephone number on the Signal Module dial pad. Access pauses can be entered by momentarily pressing the **PSE** button.
7	Listen for dial tone in the headset, and momentarily press the Signal Module **SND** button. The dialed number will be outpulsed each time the **SND** button is pressed. *Note:* Outpulsing will be interrupted wherever pauses were entered when the number was stored in memory. When a pause is encountered, the **LED** indicator above the **HLD** button will light and remain lit until the **SND** button is pressed. Momentarily press the **SND** button to continue outpulsing. After connection is completed, talking is possible via headset.

PROCEDURE 48
DIALING IN ABBREVIATED RECALL DP, TT, OR MF MODE

This procedure is used to dial a circuit using the Abbreviated Recall DP, TT, or MF Mode. Up to ten 12-digit telephone numbers can be stored in memory, and to recall them for circuit dialing, only a one-digit memory address code is entered.

Note: It is recommended that Test Facility power be left on at all times. If the 1432 Signal Module is powered down, all stored telephone numbers will automatically be erased.





STEP	PROCEDURE
1	Momentarily press the 1432 **CLR** button. The indicator above the **CLR** button will extinguish, and the digital display will go dark.
2	Press the 1432 **STO** button, and hold pressed while performing steps 3 and 4 below.
3	Enter the desired one-digit memory address code (0 through 9) on the 1432 dial pad.
4	Enter the desired telephone number on the 1432 dial pad. Access pauses can be entered by momentarily pressing the **PSE** button. *Note:* If the selected memory address contains a previously stored number, that number will be replaced automatically by the new number being entered.
5	Observe the 1432 digital display to verify correct number entry.
6	Release the 1432 **STO** button.
7	Repeat steps 1 through 6 for entry of additional telephone numbers (up to 10 numbers total) as desired. A different memory address code must be used for each number entered.
8	To verify a number stored in memory: (a) Press the 1432 **CLR** button to clear the digital display. (b) Press the 1432 **RCL** button. (c) Enter the one-digit memory address code used to store the number being verified (step 3). (d) Observe the 1432 digital display to verify correct number entry. If number is incorrect, repeat steps 1 through 6 for that number.
9	Perform one of the following procedures to access the circuit to be dialed: (a) Two-wire loop circuit—Procedure 15. (b) Two-wire loop/B & G circuit—Procedure 16. (c) Two-wire duplex circuit—Procedure 18. (d) Four-wire simplex loop/B & G circuit—Procedure 35. (e) Four-wire duplex circuit—Procedure 37. (f) Four-wire SF circuit—Procedure 39. (g) E & M circuit—Procedure 41. (h) Telephone line terminated at 1422 Module—Procedure 42.
10	Momentarily press the 1432 **DP**, **TT**, or **MF** button for the desired signaling mode. The indicator above the pressed button will light.
11	Momentarily press the 1432 **PPS** button if fast signaling is desired. The indicator above the **PPS** button will light.

(Continued on next page)

12	Momentarily press the 1432 **CLR** button. The indicator above the **CLR** button will extinguish, and the digital display will go dark.
13	Momentarily press the 1432 **RCL** button.
14	Enter the one-digit memory address code of the number to be dialed. The number stored at that address will be shown on the digital display.
15	Listen for dial tone in the headset, and press the 1432 **SND** button. The number will be outpulsed each time the **SND** button is pressed. *Note:* Outpulsing will be interrupted wherever pauses were entered when the number was stored in memory. When a pause is encountered, the **LED** indicator above the **HLD** button will light and remain lit until the **SND** button is pressed. Momentarily press the **SND** button to continue outpulsing. After connection is completed, talking is possible via headset.

ADC™
Telecommunications

1400 Test Facility User Manual

Volume 2

Site Preparation
Installation
J Drawings
T Drawings
SD Drawings

ADCP-66-155
8th Edition, Issue 1, October 1986

ADC Telecommunications™

1400 Test Facility User Manual

Volume 2

Site Preparation
Installation
J Drawings
T Drawings
SD Drawings

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REVISION HISTORY

REVISION	DATE	REASON FOR CHANGE	REVISION	DATE	REASON FOR CHANGE
1st Edition Issue 1	6/76	Original	5th Edition Issue 1	11/82	Added 1462 and 1462 Supervision Modules
1st Edition Issue 2	8/76	Equipment revision	6th Edition Issue 1	12/83	Replaced 1412C, 1422, 1432, 1433, and 1443C Module figures to depict new front panel layouts
1st Edition Issue 3	10/76	Corrections	7th Edition Issue 1	5/84	Incorporated 1461 and 1462 SF printed circuit board redesign changes and technical revisions
2nd Edition Issue 1	2/77	Corrections	7th Edition Issue 2	11/84	Deleted 1461 Supervision Module
3rd Edition Issue 1	7/77	Added J, T, and SD Drawings; reworked text	8th Edition Issue 1	10/86	Deleted 1432 and 1433 Signal Modules and replaced with 1434 and 1435 Signal Modules
3rd Edition Issue 2	11/79	Revised checkout procedures; eliminated foldouts			
4th Edition Issue 1	6/81	Technical revisions			

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*Indicates pages changed, added or deleted by current change.

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INTRODUCTION

This is Volume 2 of the user manual for ADC's 1400 Series Test Facilities shown on page iv. The manual is arranged in three volumes as follows:

Volume 1 — Description and Operation

Section 1 — Description:
- Physical and Functional Description
- Description of Controls and Indicators
- System Specifications

Section 2 — Operation:
- Step-by-Step Procedures to Perform Each Test Facility Function

Volume 2 — Site Preparation and Installation

Section 1 — Site Preparation:
- Test Facility Dimensions and Weight
- Environmental and Power Requirements
- Office Interface Requirements
- Installation Tools and Equipment

Section 2 — Installation:
- Uncrating and Inspection
- Physical and Electrical Installation
- Installation/Strapping Options
- Installation Checkout Procedures

Section 3 — J Drawings
- Equipment Requirements and Options
- Equipment/Subassembly Part Numbers
- Assembly Drawings

Section 4 — T Drawings:
- Cable and Power Distribution Diagrams
- Cable Assignment Drawings
- Connector/Terminal Block Drawings

Section 5 — SD Drawings:
- Schematic Diagrams

Volume 3 — Maintenance and Calibration

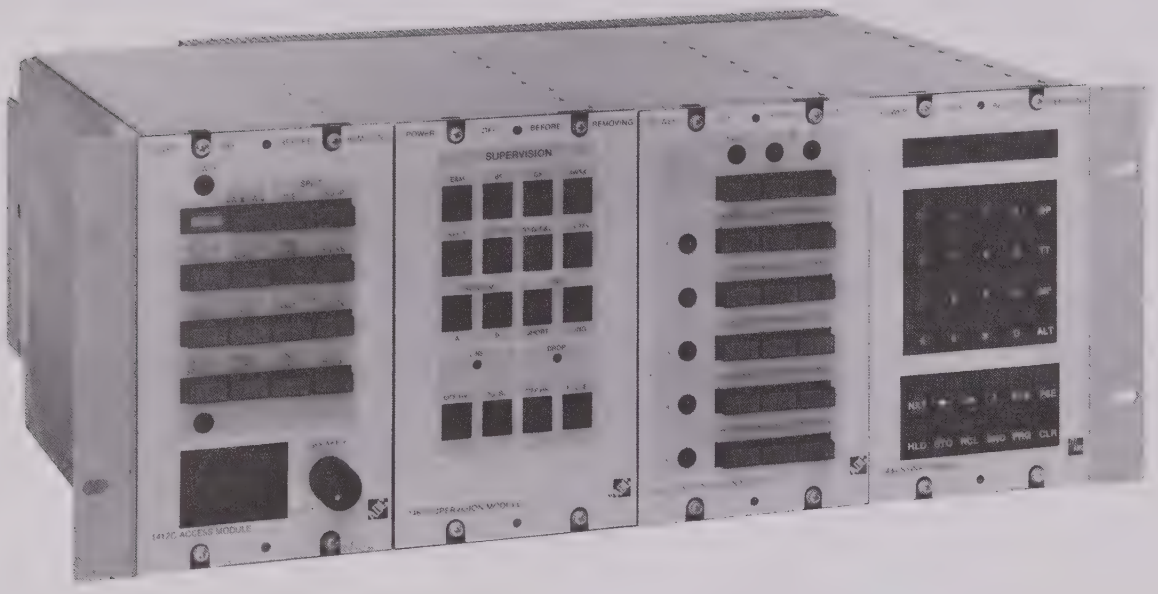
Section 1 — Circuit Description:
- Overall Block Diagram
- General Circuit Description and Theory of Operation

Section 2 — Fault Isolation:
- Troubleshooting Tables

Section 3 — Repair:
- Module/Subassembly Replacement/Repair

Section 4 — Calibration:
- System Tolerances and Calibration Procedures

Section 5 — General Information:
- Warranty
- Repair/Exchange Policy and Charges
- Customer Services



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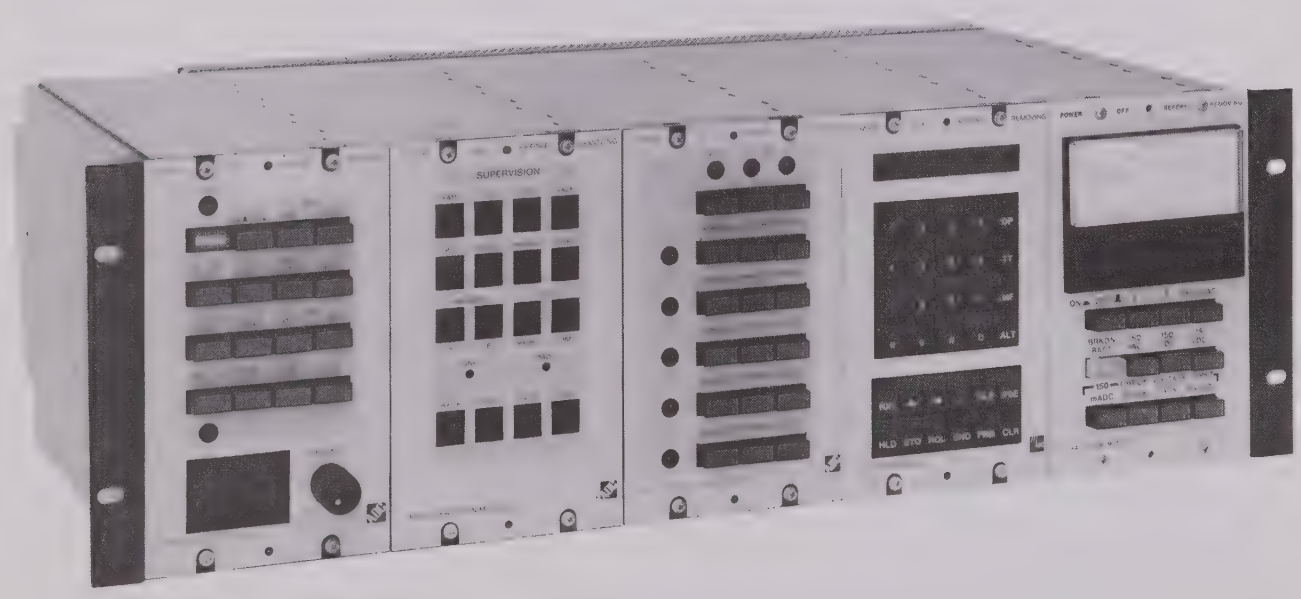

1403

TYPICAL 1400 TEST FACILITIES

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1. GENERAL

1.01 This section contains information necessary to prepare the office for installation of the 1400 Test Facility. Included are requirements for space, environment, office interface, and installation tools and equipment.

2. OFFICE REQUIREMENTS

TEST FACILITY DIMENSIONS

2.01 The 1400 Test Facility is shipped ready for installation in a 19- or 23-inch relay rack. Maximum crated and uncrated dimensions as are follows:

TEST FACILITY	CRATED DIMENSIONS		
	HEIGHT	WIDTH	DEPTH
Four-Module (1402)	15.0 in. (38.1 cm)	28.0 in. (71.12 cm)	16.0 in. (40.64 cm)
Five Module (1403)	15.0 in. (38.1 cm)	28.0 in. (71.12 cm)	16.0 in. (40.64 cm)

TEST FACILITY	UNCRATED DIMENSIONS		
	HEIGHT	WIDTH	DEPTH
Four-Module (1402)	7.0 in. (17.8 cm)	19.0 in. (48.3 cm)	11.2 in. (28.5 cm)
Five Module (1403)	7.0 in. (17.8 cm)	23.0 in. (58.4 cm)	11.2 in. (28.5 cm)

TEST FACILTY WEIGHT

2.02 Crated and uncrated weights of the 1400 Test Facility are as follows:

TEST FACILITY	CRATED WEIGHT	UNCRATED WEIGHT
Four-Module (1402)	60 to 70 lbs. 27.3 to 31.8 kg	36 to 46 lbs. 16.4 to 20.9 kg
Five-Module (1403)	70 to 80 lbs. 31.8 to 36.4 kg	45 to 55 lbs. 20.5 to 25.0 kg)

3. TEST FACILITY REQUIREMENTS

ENVIRONMENT

A. Shipping and Storage

3.01 The 1400 Test Facility can be shipped and/or stored in any ambient temperature/humidity that does not exceed the following:

(a) −40°C (−40°F) to +70°C (+168°F).

(b) 5% to 95% relative humidity without condensation.

B. Operating

3.02 The 1400 will operate in any ambient temperature/humidity that does not exceed the following:

(a) +15°C (+59°F) to +50°C (+112°F).

(b) 5% to 95% relative humidity without condensation.

POWER

3.03 The 1400 Test Facility operates on −48 Vdc office battery fused or breakered at the office distribution panel for one Ampere maximum. Office battery to the Facility should be supplied and fused separate from any other office equipment.

OFFICE INTERFACE

3.04 The following Test Facility-to-office interface is required in addition to the power inputs:

(a) Tel Lines — Up to five 1A2 Keyset, POTS, or 101 Trunk tel lines for each 1422 Communication Module in the Test Facility.

(b) Keyset Common Audible Signal — Ground, −10 to −56 Vdc, or 16-66 Hz, 20-130 Vac.

(c) Interbay Trunks — One or two interbay trunks for each 1422 Communication Module in the Test Facility.

(d) Ringing Generator — 105 Vac, 10 to 20 Hz, fused or ballasted for ¼ Ampere maximum.

(e) Test Battery (Breakdown) — Up to 150 Vdc floating, fused for ¼ Ampere maximum

3.05 Tel lines are connected to a standard 50-pin connector at the rear of the Test Facility, while all other connections are to wire-wrap pins, also at the rear of the Test Facility.

4. TOOLS AND EQUIPMENT

4.01 Tools and equipment required for installation and checkout of the 1400 Test Facility are as follows:

(a) Flat-tip and phillips-head screwdrivers.

(b) Wire cutters and strippers.

(c) Wire-wrap gun and bits for .045 inch square wire-wrap posts; 16, 18, 20 and 22 gauge for power wiring, and 24 gauge for signal wiring.

(d) Volt-ohm-milliammeter (VOM).

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INSTALLATION

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1. GENERAL

1.01 This section, along with the J and T Drawing Sections, provide information necessary to uncrate, inspect, install, and test the 1400 Test Facility.

2. UNCRATING AND INSPECTION

2.01 Remove the 1400 Test Facility from the shipping container and inspect it for signs of damage. If there are any damaged or missing parts, immediately file a claim with the carrier and notify ADC.

2.02 Check operation of all controls in accordance with Table 2-1. Pushbuttons are of the following types:

(a) Momentary — Button is spring-loaded and returns to normal position when released. Function is active as long as button is pressed.

(b) PPL (Push-Push Latching) — Button is pressed to activate, and pressed again to release. In activated position, colored area is exposed through aperture in button.

(c) Interlocking — Only one button in the group can be pressed at a time. Pressing one releases another.

3. POSITIONING AND MOUNTING

3.01 The 1400 Test Facility is shipped premounted to metal shipping bars. These bars hold the modules in their assigned position, and allow inter-module wiring to be completed before shipping from the factory. The shipping bars are to be removed when the Test Facility is mounted to the office equipment rack.

Table 2-1
Control Action Checks

UNIT	CONTROL	ACTION
1412C	GND START and Ring All other pushbuttons SPEAKER	Momentary PPL 300° Rotation — OFF detent
1422	HOLD All other pushbuttons	Momentary PPL
1434	All pushbuttons	Momentary
1435	All pushbuttons	Momentary
1443C	BRKDN BATT All other pushbuttons	Momentary PPL
1462	All pushbuttons	Touch

3.02 Using the screws (two sizes) holding the modules to the shipping bars, proceed as follows to mount the Test Facility into the rack:

(a) Remove the hex nut and rear washer from each of the longer screws holding the equipment modules to the shipping bars.

(b) Mount the modules to the equipment rack using the longer screws, screwing each approximately half-way into the rack.

(c) Remove the shorter screws from the shipping bars, and remove the shipping bars from the Test Facility.

(d) Secure the modules to the equipment rack by turning the longer screws all the way in.

(e) Install the previously removed shorter screws to complete the installation of the Test Facility into the rack.

4. CONFIGURING FOR OFFICE

4.01 Various operating options are available within the 1400 Test Facility, and are selected as determined by specific office requirements. Many of these options should be considered prior to actual wiring of the Test Facility into the central office; others are incorporated as necessary as the Test Facility wiring is installed.

4.02 Table 2-2 shows the options to be considered before installation wiring has begun. The table shows the variable functions as normally wired into each module when shipped from the factory, along with modifications that can be made to each in the central office. Options in addition to those shown in the table are described in other appropriate installation sections of the text.

4.03 Selection of each option shown in Table 2-2 is described below. Refer to Figure 2-1 for location of the various modules, connectors, and components.

Note: Actual module locations are also optional and may differ from those shown in the figure.

1412C ACCESS MODULE OPTIONS

4.04 The Test Facility is shipped with the following options enabled:

(a) Option 1 — Monitoring of a 2-wire circuit after circuit is split.

(b) Option 2 — Monitoring of a 4-wire circuit after circuit is split.

(c) Option 3 — Retaining of 600 ohm termination across a 4-wire circuit when the 1412C **AUX** button is pressed.

Table 2-2
Options to be Considered Before Wiring Begins

TEST FACILITY MODULE	FUNCTION	AS SHIPPED	OPTIONAL MODIFICATION
1412C Access Module	Split circuit monitoring	2- and 4-wire monitor enabled	2- and/or 4-wire monitor disabled
	2-wire hold coil	Retained when AUX is selected	Disconnected when AUX is selected
	4-wire termination	Retained when AUX is selected	Disconnected when AUX is selected
1422 Communication Communication Module	Tel line programming	POTS	1A2 keyset or 101 trunk
	Interbay trunks	2- and 4-wire IBT's	2-wire IBT's only
	IBT talk battery	Supplied by Test Facility	Required externally
	IBT audible alarm	Enabled	Disabled
	Night alarm external bell	Enabled	Disabled
		Common and normally-open contacts provided	Common and normally-closed contacts provided
1443C VOM Module	Test battery input	Negative voltage required	Positive voltage required
	tip/ring ground reference	Frame ground	Office ground
1462 Supervision Module	E & M Conditioning and signaling	Only Type I E & M selectable at the front panel	Type 1 E & M plus two additional sets of E & M conditions selectable at the front panel

(d) Option 4 — Retaining of high impedance hold coil across a 2-wire circuit when the 1412C **AUX** button is pressed.

4.05 To disable any of these functions:

(a) Remove the module retaining screws at center top and center bottom of the 1412C Access Module front panel.

Caution: Static discharge of personnel may cause damage to module components. Always discharge static through a convenient ground before contacting module components and circuit boards.

(b) Remove the 1412C Module from the Test Facility shelf.

(c) Locate the appropriate option switch(es) on the right side of the 1412C Module (Figure 2-2), and set to off (down) position.

(d) Reinstall the 1412C Module in the Test Facility shelf.

1422 COMMUNICATION MODULE OPTIONS

A. Telephone Line Programming

4.06 The 1422 Communication Module may be programmed for operation with:

(a) Ring-in/Dial-out (POTS) lines.

(b) 1A2 Keyset lines with various common audible and A1 ground conditions.

(c) 101 trunk lines with various sleeve and lamp return battery/ground conditions, and with either 24 or 48 Vdc office battery.

4.07 The lines may be all of the same type, or may be any combination of these types, depending on module programming.

4.08 The type(s) of lines for which the module is programmed is determined by the type(s) of Line Switch Boards included in the module, and on the strapping of terminals on the module's Line Switch Boards and Customer Connector Board. The module can be purchased pre-programmed for specific office requirements, and can be reprogrammed in the office

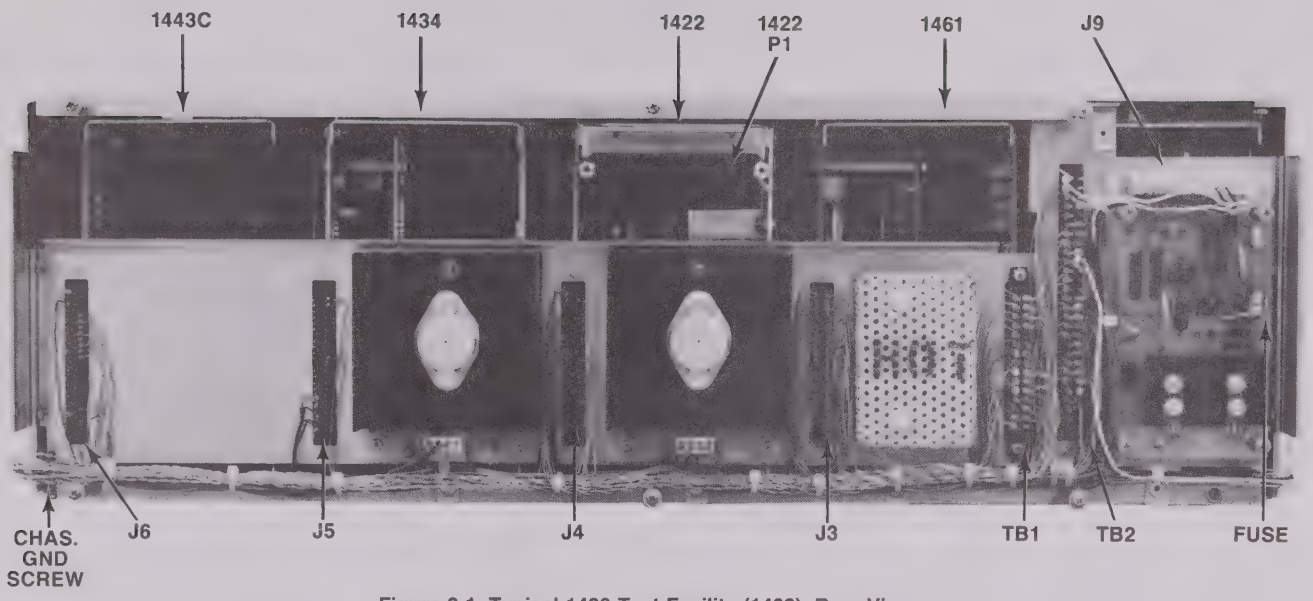


Figure 2-1. Typical 1400 Test Facility (1403), Rear View

as requirements change. The type of Line Switch Board and required circuit board strapping for each line type are described in the following paragraphs.

B. Line Switchboard Type/Strapping

4.09 If option changes are to be made in the 1422 Communication Module, prepare the module as follows:

(a) Remove the module retaining screws at center top and center bottom of the module front panel.

Caution: Static discharge of personnel may cause damage to module components. Always discharge static through a convenient ground before contacting module components and circuit boards.

(b) Unplug the module, and remove it from the Test Facility shelf.

(c) Remove the remaining four screws on the front of the module, and remove the module front panel.

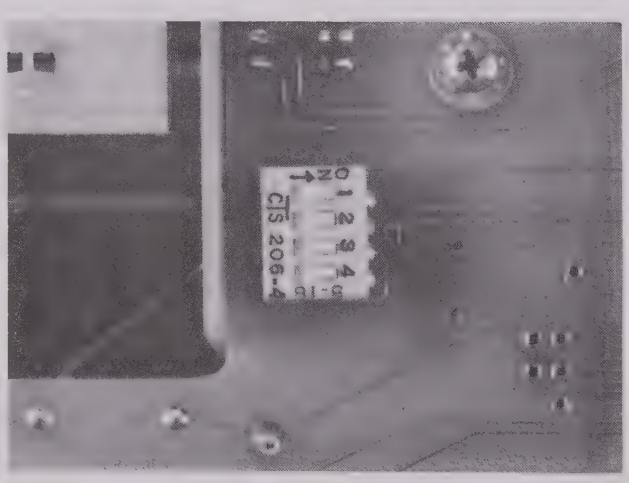


Figure 2-2. 1412C Access Module Option Switches

4.10 To identify the type of line for which a Line Switch Board is programmed, or to reprogram for a different type of line, proceed as follows:

(a) Place module right side up, leave top card in place. Remove front face plate. Unplug the Line Switch boards #2 through #6 from the 1422 Module.

(b) Check the card part number, located near the connector, and replace if necessary:

(1) Part Number 2-32940-0010 — Used for POTS or 1A2 Keyset.

(2) Part Number 2-32940-0020 — Used for 1A2 Keyset.

(3) Part Number 2-32940-0030 — Used for 101 trunks.

(c) Check strapping of E-terminals on the Line Switch Board, and restrap as necessary:

Note: The connections described in the following steps are the only E-terminal connections that should exist for each type of line. Any other E-terminal connections should be removed.

(1) Part Number 2-32940-0010 (Figure 2-3):

- POTS — E1 connected to E2, and E3 connected to E4.
- 1A2 Keyset — No strapping on E1, E2, E3, and E4.

(2) Part Number 2-32940-0020. No strapping on this board.

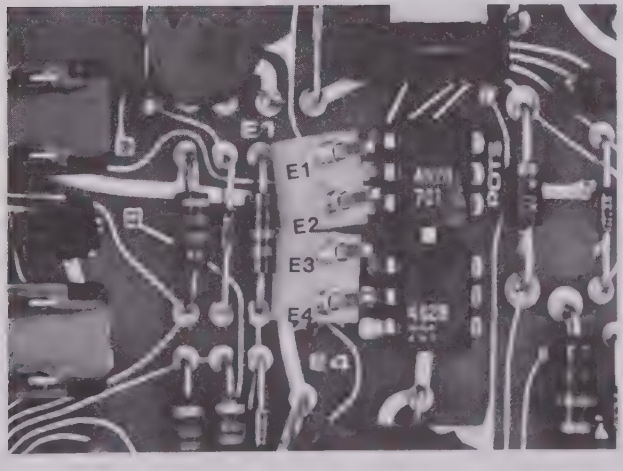


Figure 2-3. 1422 Line Switch Board Programming Terminals (P/N 2-32940-0010)

(3) Part Number 2-32940-0030 — Figure 2-4):

- Lamp Return — E5 connected to E6 for Lamp Return Ground operation, or E6 connected to E7 for Lamp Return Battery operation.
- Sleeve — E8 connected to E10 for Sleeve Ground operation, or E9 connected to E10 for Sleeve Battery operation.

(d) Carefully reinstall the Line Switch Board in the 1422 Module.

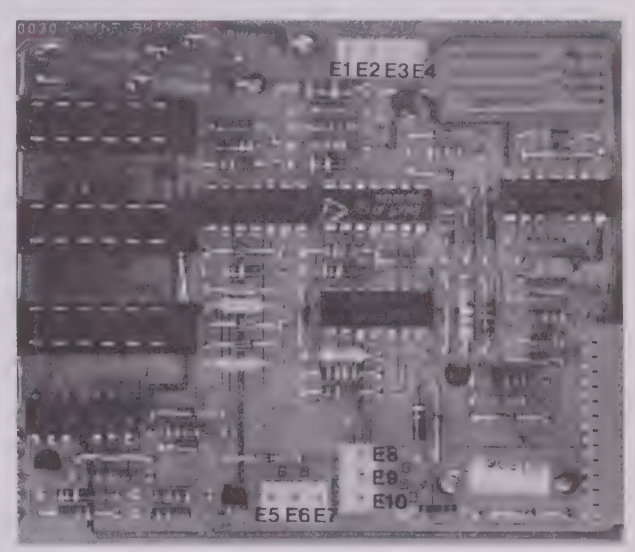


Figure 2-4. 1422 Line Switch Board Programming Terminals (P/N 2-32940-0030)

C. Customer Connector Board Strapping

Common Audible Strapping

4.11 Remove and examine the Customer Connector Board (the board with the amphenol connector, Figure 2-5) to determine the type of line(s) for which it is strapped, and restrap as necessary:

(a) All lines POTS and/or 101 Trunk: No strapping on E1 through E8.

(b) One or more line 1A2 Keyset:

(1) Common Audible

Note: The Keyset Common Audible signal is supplied to the Test Facilty on pins 25 and 50 of the 1422 Communication Module customer connector.

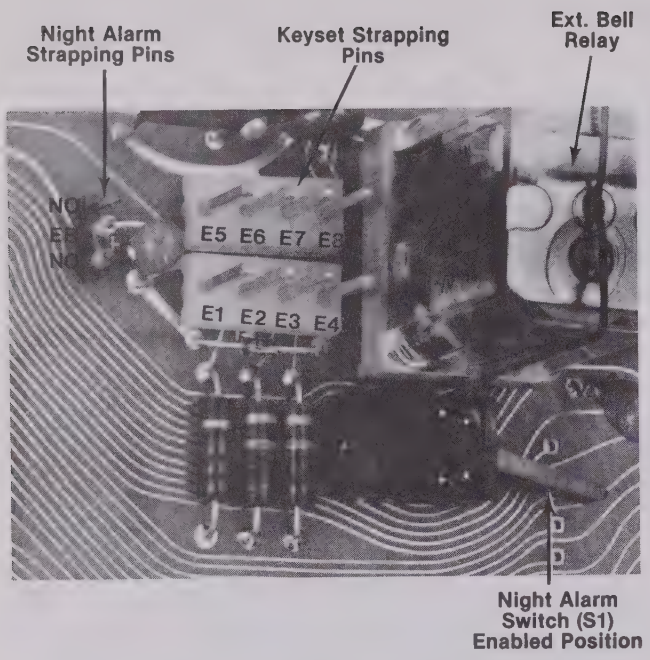

Night Alarm Strapping Pins
Keyset Strapping Pins
Ext. Bell Relay
E5 E6 E7 E8
E1 E2 E3 E4
Night Alarm Switch (S1) Enabled Position

Figure 2-5. 1422 Customer Connector Board, Keyset and Night Alarm Strapping

- Signal applied between P1-25 and P1-50, but P1-50 not grounded in the Key Service Unit (KSU) — E6 connected to E7.

- P1-50 switched to central office ground within the KSU — E1 connected to E2.

- P1-25 switched to central office ground within the KSU — E1 connected to E2, and E5 connected to E6.

- Floating pair of KSU contacts connected to P1-25 and P1-50 — E1 connected to E2, and E5 connected to E7.

(2) A1 Lead Ground

Note: It is recommended that the A1 lead ground be supplied by the Test Facility rather than by the KSU.

- Test Facility A1 ground to Customer Connector P1-2 — E7 connected to E8.

Note: E7 should not be connected to E8 if the A1 leads are also grounded in the KSU. Reinstall the Customer Connector Board.

Night Alarm Connections

4.12 The night alarm external bell relay contacts, as shipped, are strapped for common and normally-open contact operation. If common and normally-closed contacts are required, remove the strap between terminals EB and NO on the Customer Connector Board (Figure 2-5), and connect a strap between terminals EB and NC.

4.13 If the night alarm requires common and normally-closed contacts, remove the Customer Connector Board (Figure 2-6) from the module as follows:

(a) Remove the two screws securing the Customer Connector Board to the top of the module.

(b) Unplug the audible alarm connector from the underside of the Customer Connector Board.

(c) Unplug the Customer Connector Board and remove from the module.

4.14 After completion of all necessary changes, reassemble the module, and reinstall it in the Test Facility shelf.

4.15 The night alarm relay contacts in the 1422 Module are rated for 56 Vdc at 2 Amperes maximum. Contact protection is provided on the normally-open contacts only. If normally-closed contacts are used, and the load is non-resistive, external protection must be provided and/or the 2 Ampere rating must be greatly reduced.

Night Alarm Enable/Disable

4.16 To enable the night alarm, set switch S1 on the Customer Connector Board (Figure 2-5) away from the external bell relay; to disable the alarm, set switch S1 toward the relay.

D. Interbay Trunks

2/4 Wire Trunk Interface

4.17 The Test Facility, as shipped, is strapped for 2- or 4-wire IBTs, with headset/handset interface provided in the 1422 Communication Module. If the Test Facility is to be used only with 2-wire IBTs, cut straps connecting E7 to E8 (IBT-1) and/or E5 to E6

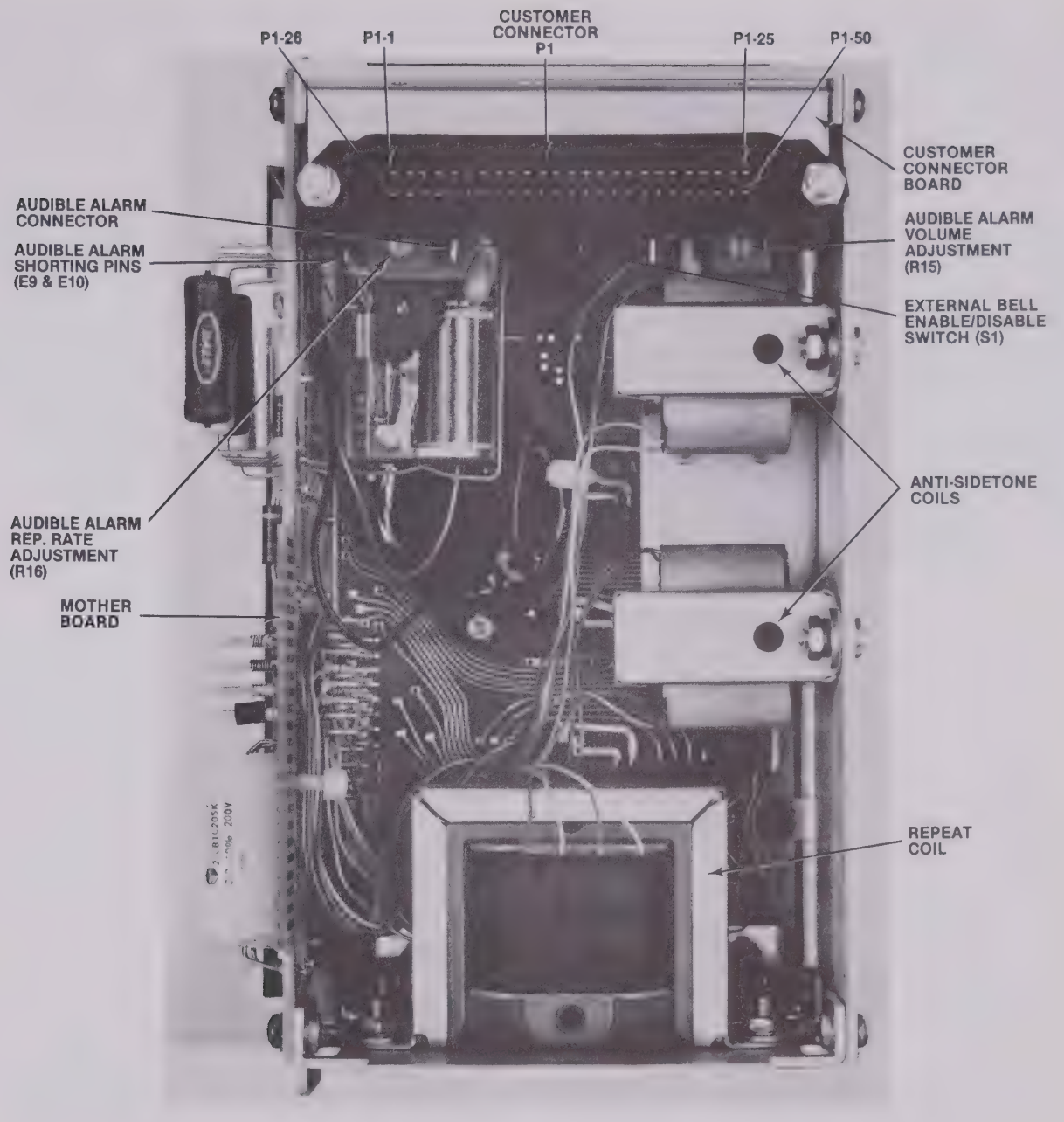


Figure 2-6. 1422 Communication Module, Rear View

(IBT-2) on the 1422 Motherboard. Cutting these straps disconnects the anti-sidetone coils to improve frequency response on the 2-wire IBTs (refer to Figure 2-7).

IBT Talk Battery

4.18 The Test Facility, as shipped, is wired to supply talk battery to the IBTs. To disconnect this talk battery, make one or both of the following strapping changes on the 1422 Motherboard, as shown in Figure 2-7.

(a) Eliminate talk battery to IBT-1 by removing straps connecting E1 to E2 and E3 to E4.

(b) Eliminate talk battery to IBT-2 by removing straps connecting E9 to E10 and E11 to E12.

Caution: These straps must be disconnected if external IBT talk battery is to be used.

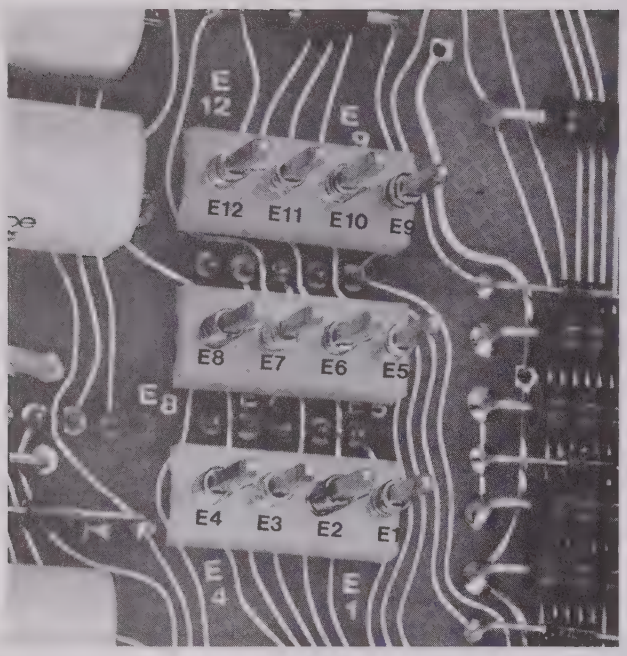


Figure 2-7. 1422 Motherboard, IBT Strapping

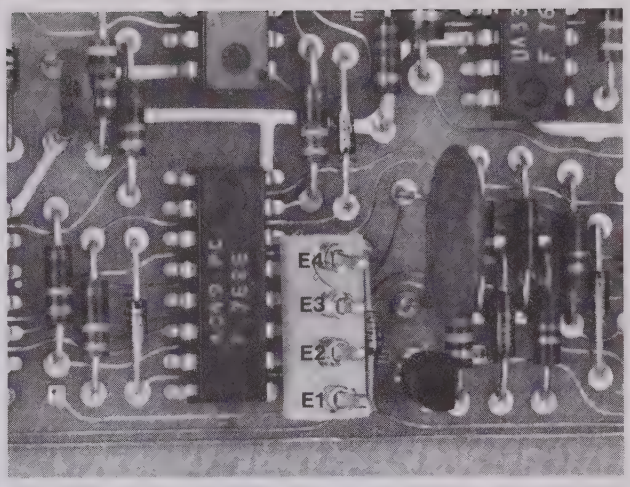


Figure 2-8. 1422 Hold Board, Audible Alarm Strapping

IBT Audible Alarm

4.19 The Test Facility, as shipped, is wired to provide an audible alarm whenever the L-lead of an IBT is grounded by the normally-open contacts on an IBT headset jack, or by another 1400 Test Facility. To disable this alarm:

(a) Unplug the 1422 Hold Board and remove through the front of the module.

(b) Remove the jumpers connecting E1 to E2 (IBT-1) and E3 to E4 (IBT-2) on the Hold Board (Figure 2-8).

(c) Reinstall the Hold Board in the 1422 Module.

Note: Removal of these jumpers will not affect operation of the IBT indicators.

1443C VOM MODULE OPTIONS

4.20 If option changes are to be made in the 1443C VOM Module:

(a) Remove the module retaining screws at center top and center bottom of the module front panel.

(b) Unplug the module, and remove it from the Facility shelf.

4.21 After completion of all necessary changes, reinstall the module in the Test Facility shelf.

A. Breakdown Battery Polarity

4.22 The 1443C VOM Module, as shipped, is strapped for negative breakdown voltage input. If positive breakdown voltage is to be used, remove the straps connecting E2 to E3, and E5 to E6 on the VOM Board (Figure 2-9), and connect straps from E1 to E2, and E4 to E5.

B. Tip/Ring Ground Reference

4.23 The 1443C VOM Module, as shipped, is strapped for tip/ring frame ground reference. If tip/ring central office ground reference is desired, remove the strap connecting E8 to E9 on the VOM Board (Figure 2-9), and connect a strap from E7 to E8.

Note: Voltage and resistance inaccuracies may be measured if strapped for office ground reference.

1462 SUPERVISION MODULE OPTIONS

4.24 The Test Facility is shipped with both the **PGM A** and **PGM B** buttons on the 1462 front panel programmed for Type I E & M selection. Type I E & M is also enabled automatically upon 1462 E & M Mode selection. To reprogram the 1462 Module for

selection of different types of E & M conditioning and signaling:

(a) Remove the module retaining screws at center top and center bottom of the 1462 Supervision Module.

Caution: Static discharge of personnel may cause damage to module components. Always discharge static through a convenient ground before contacting module components and circuit boards.

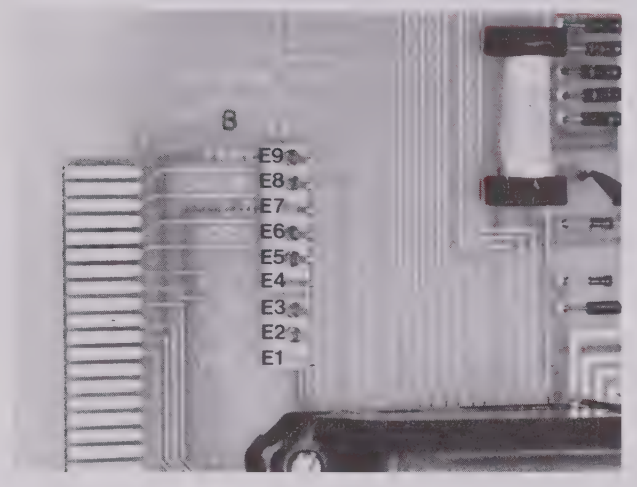


Figure 2-9. 1443C VOM Board, Strapping Pins

(b) Remove the 1462 Module from the Test Facility shelf.

(c) Locate the E & M option switches on the underside of the module (Figure 2-10).

(d) Refer to Table 2-3 for the E & M conditions that can be programmed into the module.

Note: Programming of E & M conditions into the PGM A switch is identical to programming of E & M conditions into the PGM B switch. The conditions programmed into the PGM A switch are selectable (during operation) by the front panel **PGM A** button, and the conditions programmed into the PGM B switch are selectable by the front panel **PGM B** button. The two switches thereby provide for two different types of E & M which are selectable at the front panel. These are in addition to the Type I E & M which may be enabled automatically whenever E & M mode is selected.

(e) Using a small screwdriver, set the PGM A and PGM B switch levers to the on/off positions shown in the table for the E & M conditions to be selectable at the front panel.

(f) Set lever 6 of the PGM A switch to the on or off position as follows:

(1) Lever 6 Off — Type I E & M is automatically enabled whenever 1462 E & M model is selected. E & M conditions can then be changed to programmed conditions by pressing the **PGM A** or **PGM B** button.

(2) Lever 6 On — E & M conditions programmed into the PGM A switch are automatically enabled whenever 1462 E & M Mode is selected. E & M conditions can then be changed to those programmed into the PGM B switch by pressing the **PGM B** button. Type I E & M will be selectable only if programmed into the PGM A or PGM B switch.

(g) Set lever 6 of the PGM B switch to the on position if the Test Facility contains an SI-11B Panel. Set the lever to the off position if no SI-11B is included.

(h) Reinstall the 1462 Module in the Test Facility shelf.

5. OFFICE WIRING

5.01 The 1400 Test Facility is wired into the office via terminal blocks TB1 and TB2 on the back of the 1402/1403 Equipment Shelf. Refer to Figure 2-1 and J1400-003 (1402) or J1400-004 (1403) for the exact location of all terminal blocks and terminals referenced below.

Caution: All wiring between the office and Test Facility should be connected with the Facility office battery input off or disconnected at the office distribution panel.

OFFICE BATTERY AND GROUND

5.02 Connect −48 Vdc office battery (negative lead) to TB2-20, and the office battery return ground to TB2-48. Use wire sizes as follows:

(a) Wire lengths to 90 feet — 22 gauge.

(b) Wire lengths to 150 feet — 20 gauge.

(c) Wire lengths to 230 feet — 18 gauge.

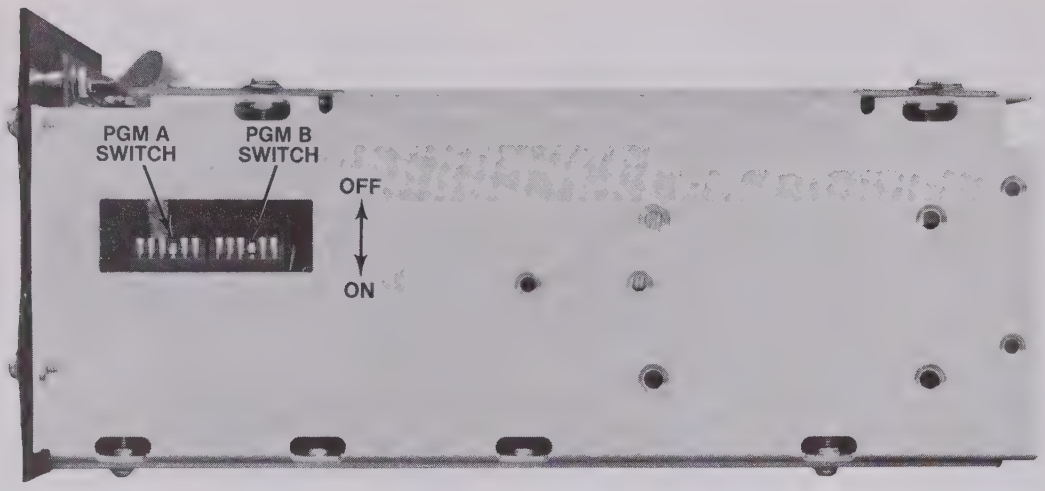


Figure 2-10. 1462 Supervision Module E & M Option Switches (Underside of Module)

Table 2-3
E & M Programming

	PGM A/PGM B SWITCH LEVERS					
E & M CONDITIONS	**1**	**2**	**3**	**4**	**5**	**6**
ON-HOOK						
E Drop: Open						
(Not Programmable)						
M Line: Open				Off		
Ground				On		
OFF-HOOK						
E Drop: Ground						
(Not Programmable)						
M Line: Ground			On			
−48 Vdc	Off	Off	Off			
+12 Vdc	On	Off	Off			
Ext. Battery		On	Off			
MONITOR						
E Line: +12 Vdc Return					On	
−48 Vdc Return					Off	
M Drop: Ground +12 Vdc Return	On		On			
−48 Vdc Return	Off					
−48 Vdc	Off	Off	Off			
+12 Vdc	On	Off	Off			
Ext. Battery + External Battery	On	On	Off			
− External Battery	Off					

(d) Wire lengths to 375 feet — 16 gauge.

Note: Office battery to the Test Facility should be supplied and fused separately from any other office equipment. Office battery is also fused in the Test Facility for one Ampere.

CHASSIS GROUND

5.03 The 1400 Modules are grounded to the 1402/1403 Equipment Shelf through the mounting screws and through the module-to-shelf connectors. Connect the office frame ground to the Equipment Shelf CHAS GND screw.

TEST BATTERY (BREAKDOWN)

5.04 Connect Test Battery voltage to TB1-29 and Test Battery return to TB1-30. Office Battery can be also used for Test Battery if desired by strapping TB1-29 to TB2-1, and TB1-30 to TB2-48.

Caution: Do not connect external Test Battery if Test Battery and Office Battery are strapped together in the Test Facility.

RINGING GENERATOR

5.05 Connect ringing generator tip (ground side) to TB2-39 and ringing generator ring to TB2-37.

EXTERNAL NIGHT BELL

5.06 An external night bell can be connected if the Test Facility contains a 1422 Communication Module. Connect the bell to TB1-23 and the bell ground return to TB1-25. Floating relay contacts and varister suppression are supplied by the 1422; however the bell and its fused power supply are provided by the customer.

AUXILIARY TEST EQUIPMENT

5.07 If auxiliary test equipment is to be hardwired into the Test Facility, connections are made directly to TB1 and TB2. If portable test equipment is to be used, the TB1/TB2 connections are made to the Test Access Jackfield, and the test equipment then connected with patch cords.

A. Transmission Test Set (TTS)

TTS Measure/Receive Input

5.08 Connect the TTS measure/receive input tip to TB2-27, and the TTS measure/receive input ring to TB2-25.

TTS Measure/Receive External Control

5.09 If TTS measure/receive activation requires control switch contacts external to the TTS, connect the ''normally open'' input to TB2-22, the ''normally closed'' input to TB2-26, and the ''common'' input to TB2-24.

TTS Oscillator

5.10 Connect the TTS oscillator tip to TB2-21, and the TTS oscillator ring to TB2-23.

TTS Oscillator External Control

5.11 If TTS oscillator activation requires control switch contacts external to the TTS, connect the ''normally open'' input to TB2-4, the ''normally closed'' input to TB2-6, and the ''common'' input to TB2-2.

B. Volt-Ohm-Milliammeter (VOM)

5.12 Connections to an auxiliary VOM are dependent upon whether or not the Test Facility contains a 1443C VOM Module. In addition, if the auxiliary VOM is to be used for measuring current, it must provide selectable −48 Vdc outputs for activating the tip and ring lead selection relays in the 1412C Access Module. At the rear of the Test Facility, connect the auxiliary VOM as follows:

(a) Test Facility with 1443C VOM Module:

(1) Connect the VOM tip to pin 18 of the 1443C connector.

(2) Connect the VOM ring to pin 20 of the 1443C connector.

(3) Connect the VOM tip lead current selection output to pin 14 of the 1443C connector.

(4) Connect the VOM ring lead current selection output to pin 16 of the 1443C connector.

(a) Test Facility without 1443C VOM Module:

(1) Conenct the VOM tip to TB2-31.

(2) Connect the VOM ring to TB2-29.

(3) Connect the VOM tip lead current selection output to TB2-34.

(4) Connect the VOM ring lead current selection output to TB2-36.

C. Signal Test Set

5.13 Connect the auxiliary Signal Test Set tip to TB1-24, and the Signal Test Set ring to TB1-26. The test set will then be connected across an accessed circuit through the 1462 Supervision Module when the 1462 **SIG TST** button is pressed.

HEADSET JACKS

5.14 Connect headset jacks as shown in Figure 2-11. Jacks in a Test Access Jackfield may be used for this purpose if desired. SF is filtered internally to the 1412C Access Module.

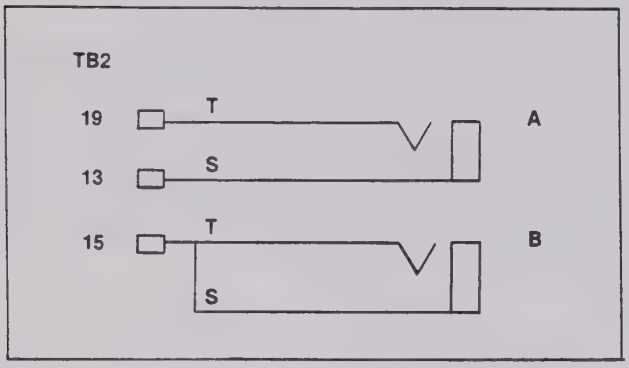


Figure 2-11. Headset Jack Connections

TEST CIRCUIT ACCESS JACKS/CORDS

5.15 Connect the Test Facility to a Test Access Jackfield and/or Cord Reel Panel for pluggable access to circuits to be tested.

A. Two-Wire Connections

5.16 Connect two-wire cords/jacks to TB1 and TB2 as follows:

(a) 2-wire line tip to:

(1) TB1-16 if Test Facility contains a 1461 or 1462 Supervision Module.

(2) TB2-55 if Test Facility does not contain a Supervision Module.

(b) 2-wire line ring to:

(1) TB1-18 if Test Facility contains a 1462 or 1462 Supervision Module.

(2) TB2-53 if Test Facility does not contain a Supervision Module.

(c) 2-wire drop tip to:

(1) TB1-20 if Test Facility contains a 1461 or 1462 Supervision Module.

(2) TB1-51 if Test Facility does not contain a Supervision Module.

(d) 2-wire drop ring to:

(1) TB1-22 if Test Facility contains a 1461 or 1462 Supervision Module.

(2) TB2-49 if Test Facility does not contain a Supervision Module.

B. Four-Wire Connections

5.17 Connect four-wire cords/jacks to TB2 as follows:

(a) 4-wire line transmit tip to TB2-41.

(b) 4-wire line transmit ring to TB2-43.

(c) 4-wire line receive tip to TB2-40.

(d) 4-wire line receive ring to TB2-38.

(e) 4-wire drop transmit tip to TB2-47.

(f) 4-wire drop transmit ring to TB2-45.

(g) 4-wire drop receive tip to TB2-42.

(h) 4-wire drop receive ring to TB2-44.

C. Signal Lead Connections

5.18 Connect signal cords/jacks to TB1 as follows:

(a) Signal line tip (E-lead) to TB1-15.

(b) Signal line ring (M-lead) to TB1-17.

(c) Signal drop tip (E-lead) to TB1-19.

(d) Signal drop ring (M-lead) to TB1-21.

6. TELEPHONE LINE CONNECTIONS

1A2 KEYSET INSTALLATION

6.01 Telephone lines are wired into the 1400 Test Facility via connector P1 on the back of the 1422 Communication Module (Figure 2-3). This connector is accessible through the back of the Test Facility shelf.

A. 1A2 Keyset Tel Line Connections

6.02 Connect telephone lines to 1422 Communication Module P1 as follows:

(a) Line 1

(1) Line 1-R to P1-1

(2) Line 1-T to P1-26

(3) Line 1-A to P1-27

(4) Line 1-L to P1-3

(5) Line 1-LG to P1-28

(6) Line 1-A1 to P1-2

Note: Do not ground the A1 lead in the KSU if a ground is already provided by the Test Facility's 1422 Communication Module (refer to paragraph 4.13).

(b) Line 2

(1) Line 2-R to P1-4

(2) Line 2-T to P1-29

(3) Line 2-A to P1-30

(4) Line 2-L to P1-6

(5) Line 2-LG to P1-31

(c) Line 3

(1) Line 3-R to P1-7

(2) Line 3-T to P1-32

(3) Line 3-A to P1-33

(4) Line 3-L to P1-9

(5) Line 3-LG to P1-31

(d) Line 4

(1) Line 4-R to P1-10

(2) Line 4-T to P1-35

(3) Line 4-A to P1-36

(4) Line 4-L to P1-12

(5) Line 4-LG to P1-37

(e) Line 5

(1) Line 5-R to P1-13

(2) Line 5-T to P1-38

(3) Line 5-A to P1-39

(4) Line 5-L to P1-15

(5) Line 5-LG to P1-40

B. 1A2 Keyset Common Audible

6.03 Connect the KSU common audible line to P1-25, and the KSU common audible return line to P1-50. If more than one 1422 Communication Module has access to the same keyset line(s), connect the keyset common audible signal to P1-25 and P1-50 on each.

POTS OR 101 TRUNK INSTALLATION

6.04 Connect the tip and ring of each telephone line as shown above for 1A2 Keyset (paragraph 6.02). In addition, if more than one 1400 Test Facility is connected to the same line(s), connect the corresponding A and L leads (also shown in paragraph 6.02). This is necessary to correctly display supervision of the line(s) at each 1400 location.

EXTENSION PHONES

6.05 The 1400 Test Facility can be used with extension phones equipped with an A lead hookswitch. If extension phones are to be used with POTS lines, the A and A1 leads must be connected (paragraph 6.02), as well as the tip and ring leads. Extension phones on POTS lines will be unable to place calls on hold, but can pick up held calls, and can seize, dial, and drop the POTS line.

7. INTERBAY TRUNK CONNECTIONS

7.01 Interbay trunks are wired to the Test Facility via terminal block TB1 at the back of the 1402/1403 Equipment Shelf. Refer to Figure 2-1 and J1400-003 (1402) or J1400-004 (1403) for the exact location of the terminal block and terminals. Refer to T1400-004, CAD/18 for wiring diagram.

IBT CONNECTIONS (FIVE LINES)

A. Two-Wire IBT Connections

7.02 Butt-ins or telephone sets must be used with Tel Networks for 2W IBT access. Connect 2W IBT telephone set or butt-in jacks as follows:

(a) IBT-1 (L) to TB1-5

(b) IBT-1 (Tip) to TB1-1

(c) IBT-1 (Ring) to TB1-3

(d) IBT-2 (L) to TB1-11

(e) IBT-2 (Tip) to TB1-7

(f) IBT-2 (Ring) to TB1-9

B. Four-Wire IBT Connections

7.03 4W IBT headsets/handsets can be used without the Tel Network, since repeat and anti-sideband coils are built into the 1422 Communication Module. Connect 4W IBT headset/handset jacks as follows:

(a) IBT-1 (L) to TB1-5

(b) IBT-1 (Tip 2) to TB1-3

(c) IBT-1 (Sleeve 2) to TB1-4

(d) IBT-1 (Tip 1 and Sleeve 1) to TB1-2

(e) IBT-2 (L) to TB1-11

(f) IBT-2 (Tip 2) to TB1-9

(g) IBT-2 (Sleeve 2) to TB1-8

(h) IBT-2 (Tip 1 and Sleeve 1) to TB1-6

IBT CONNECTIONS (TEN LINES)

7.04 Test Facilities with two 1422 Communication Modules (ten telephone lines) can be connected for either two, three, or four IBT buses.

A. Two IBT Buses

7.05 Ten-line Test Facilities are normally shipped with all ten lines capable of being conferenced to either one of two IBT buses (Figure 2-12). The Conference 1 bus of one 1422 Module is extended to the Conference 1 bus of the other 1422 Module on 1422 connector pins 32 (T) and 26 (R). The Conference 2 bus is extended on pins 29 (T) and 19 (R). Lines 1 through 10 can also be conferenced on the Tel Line from the 1412C Access Module.

B. Three IBT Buses

7.06 To install the ten telephone lines so that Lines 1 through 5 will conference to IBT-1 or IBT-2, and lines 6 through 10 will conference to IBT-1 or IBT-3 (Figure 2-13), perform the following steps:

(a) Ensure that both 1422 Communication Modules have the necessary 2-wire IBT repeat coils on the module floor, and 4-wire IBT anti-sidetone coils on the module side-plate (Figure 2-3).

(b) Re-identify the IBT-2 bus as IBT-3 on the second 1422 Module.

(c) Remove the IBT-2 extension jumpers between the two 1422 Modules on pins 29 and 19.

(d) Connect IBT-1 and IBT-2 to TB1 as described in paragraphs 7.02 and 7.03.

(e) Wire IBT-3 directly to the second 1422 Module connector pins 25 (2W-R or 4W-T2), 27 (4W-SLV 2), 21 (4W-SLV 1 and T1), 17 (2W-T) and 15 (L-lead).

(f) Remove the six screws from the front of the second 1422 Module, and remove the module's front panel.

Caution: Static discharge of personnel may cause damage to module components. Always discharge static through a convenient ground before contacting module components and circuit boards.

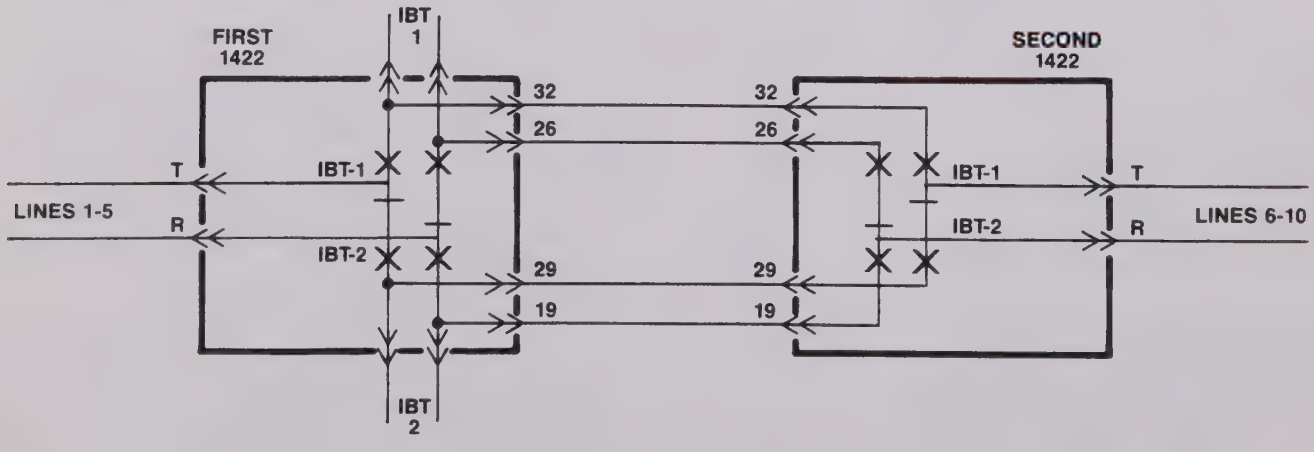


Figure 2-12. Ten Lines to Two IBT Buses (Simplified)

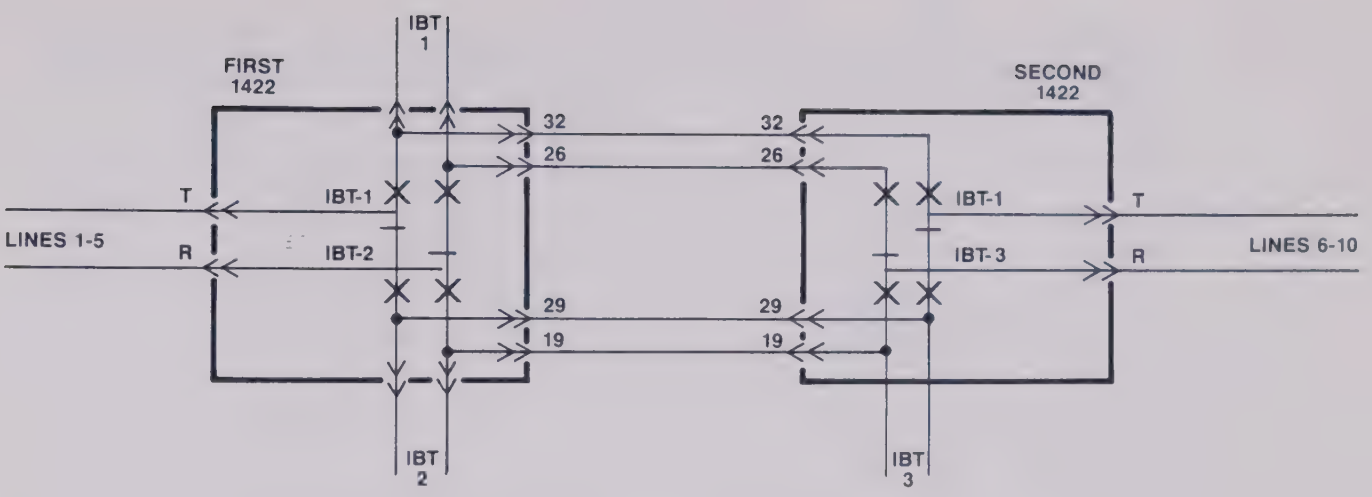


Figure 2-13. Ten Lines to Three IBT Buses (Simplified)

(g) Unplug the Hold Board from the second 1422, and remove the board through the front of the module.

(h) Connect a strap from E3 to E4 on the Hold Board (Figure 2-8).

(i) Reinstall the Hold Board in the second 1422 and reassemble the module.

C. Four IBT Buses

7.07 To install the ten telephone lines so that Lines 1 through 5 will conference to IBT-1 or IBT-2, and Lines 6 through 10 will conference to IBT-3 or IBT-4 (Figure 2-14), perform the following steps:

Note: In this configuration, Lines 1 through 5 can be conferenced to Lines 6 through 10 on the Tel Bus from the 1412C Access Module only.

(a) Ensure that both 1422 Communication Modules have the necessary 2-wire IBT repeat coils on the module floor, and 4-wire IBT anti-sidetone coils on the module sideplate (Figure 2-3).

(b) Re-identify the IBT-1 and 2 Buses of the second module as IBT-3 and -4 respectively.

(c) Remove the IBT extension jumpers between the two modules on pins 32 and 26 (IBT-1) and pins 29 and 19 (IBT-2).

(d) Connect IBT-1 and IBT-2 to TB1 as described in paragraphs 7.02 and 7.03.

(e) Connect IBT-3 to the second 1422 Module connector on pins 24 (2W-R or 4W-T), 30 (4W-SLV 2), 28 (4W-SLV 1 and T1), 17 (2W-T), and 13 (L-lead).

(f) Connect IBT-4 to the second 1422 Module connector on pins 25 (2W-R or 4W T2), 27 (4W-SLV 2), 21 (4W-SLV 1 and T1), 17 (2W-T), and 15 (L-lead).

(g) Remove the six screws from the front of the second 1422 Module, and remove the module's front panel.

Caution: Static discharge of personnel may cause damage to module components. Always discharge static through a convenient ground before contacting module components and circuit boards.

(h) Unplug the Hold Board from the second 1422, and remove the board through the front of the module.

(i) Connect straps from E1 to E2 and E3 to E4 on the Hold Board (Figure 2-8).

(j) Reinstall the Hold Board in the second 1422 and reassemble the module.

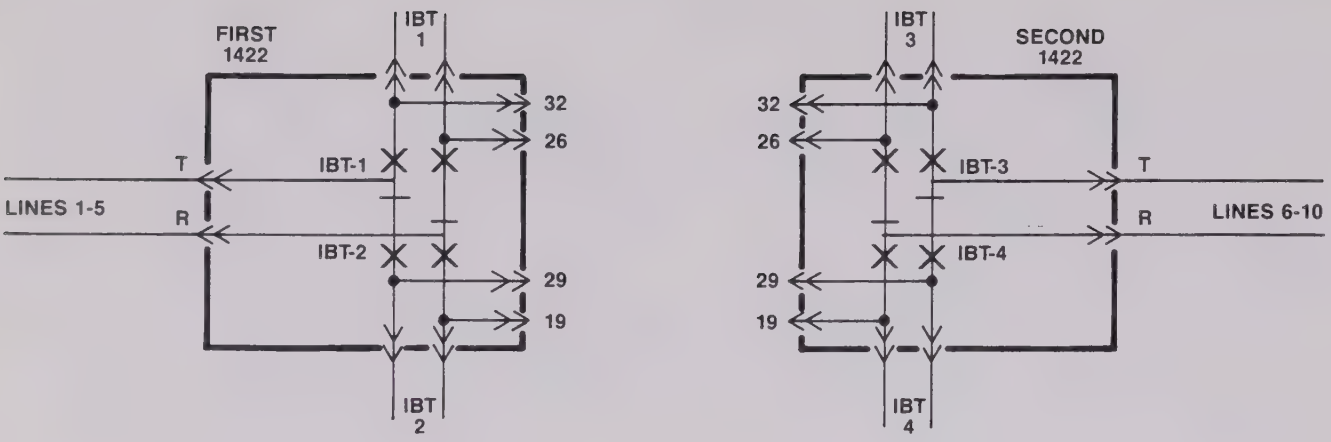


Figure 2-14. Ten Lines to Four IBT Buses (Simplified)

EXTERNAL IBT TALK BATTERY

7.08 The Test Facility IBT repeat coil split winding has ac continuity by means of an internal electrolytic (polarized) capacitor, protected by a shunt diode. The polarity of external talk battery must be negative (−) to tip and positive (+) to ring.

Caution: Do not apply external IBT talk battery unless Test Facility internal IBT talk battery straps have been disconnected (refer to paragraph 4.15).

8. 1422 COMMUNICATION MODULE ADJUSTMENTS

KEYSET C.A. ADJUSTMENT (KEYSET INSTALLATION ONLY)

8.01 Ring one of the 1A2 keyset lines, and measure ringing signal ac/dc voltage across P1-25 and P1-50 on the 1422 Communication Module (Figure 2-3). If voltage does not measure between 30 and 40 Volts:

(a) Remove the 1422 Communication Module retaining screws at center top and center bottom of the module front panel.

Caution: Static discharge of personnel may cause damage to module components. Always discharge static through a convenient ground before contacting module components and circuit boards.

(b) Unplug the 1422 Communication Module, and remove it from the Test Facility shelf.

(c) Add appropriate strap to 1422 Mother Board (Figure 2-7) as follows:

(1) C.A. less than 30 Volts — Strap E2 to E5.

(2) C.A. between 40 and 60 Volts — Strap E3 to E5.

(3) C.A. greater than 75 Volts — Strap E4 to E5.

(d) Reinstall the 1422 Module in the Facility shelf.

AUDIBLE ALARM ADJUSTMENT

8.02 To adjust the audible alarm volume and repetition rate:

(a) Locate the 1422 terminals E9 and E10, and variable resistors R15 and R16 at the back of the Test Facility (Figure 2-3).

(b) Short terminal E9 to E10 to turn on the audible alarm.

(c) Adjust R15 for desired alarm volume.

(d) Adjust R16 for desired alarm repetition rate.

(e) Remove short between terminals E9 and E10.

9. ACCEPTANCE PROCEDURES

9.01 Perform the checkout procedures in Table 2-4 in sequence (as applicable) to verify proper installation and operation of a new Test Facility. If any action cannot be verified, contact ADC Customer Service.

Table 2-4
Acceptance Procedures

STEP	ACTION	VERIFICATION
1	Apply office battery to the Test Facility.	
2	Connect telephone lines to the 1422 Module.	
3	Plug headset into Test Facility headset jacks.	
	Test Outgoing Call	
4	Press **TEL** button (line 1).	Corresponding **TEL** indicator should have a steady light and dial tone heard on the headset.
5	Press **DP** button (1434/1435).	**DP** button should light. Dial test line number with signal module. After connection is established, talking is possible via the headset.
6	Press **HOLD** button (momentary contact button).	**HOLD** and line 1 **TEL** indicator will flash (120 times per minute).
7	Release **TEL** button (line 1).	Line should be placed on hold and **TEL** indicator continue to flash (120 times per minute). **HOLD** indicator light will go out.
8	Press **TEL** button (line 1).	Corresponding **TEL** indicator should have light, the line will be removed from hold and talking over the circuit is possible.
9	Release **TEL** button (line 1).	Corresponding **TEL** indicator light should go off and the telephone line should be in an on-hook condition.
	Note: **HOLD** button (momentary contact), when successively pressed, causes the **HOLD** indicator to be alternately flashing and extinguished. When pressed to extinguish it prevents calls on active lines from being placed on or removed from hold status. When flashing, calls on active lines can be placed on or removed from hold status.	
10	Repeat the above test procedures for lines 2, 3, 4 and 5.	
11	After completing tests, press **CLR** button on signal module.	**CLR** indicator should be extinguished. Digital display should be dark (1434 only).
	Test Incoming Call	
12	Have incoming test call placed (line 1).	**TEL** indicator will flash (60 times per minute). 1422B/C Modules will furnish audible alarm.
13	Press **TEL** button (line 1).	**TEL** indicator light should be steady and talking over the circuit is possible.

Table 2-4
Acceptance Procedures (Continued)

STEP	ACTION	VERIFICATION
14	Place line on hold.	
15	Repeat steps 12, 13 and 14 for lines 2, 3, 4 and 5.	
16	Remove all lines from hold.	**TEL** indicators should be dark and an on-hook telephone line condition should exist.
17	Press and release the 1422 **IBT-1** button.	**IBT-1** indicator should light when button is pressed and go off when button is released. All **TEL** indicators should continue flashing.
18	Press and release the 1422 **IBT-2** button.	**IBT-2** indicator should light when button is pressed and go off when button is released. All **TEL** indicators should continue flashing.
19	The 1434/1435 Dialer Module will have performed its self diagnostics at this time. With the 1435, proceed to step 22.	
20	The 1434 Dial Module display will show either "MINUTES =" or "DATA RAM FAULT" or current time and date.	"DATA RAM FAULT" indicates a defective 1434 and it should be returned for service or repair. Do not continue.
21	Momentarily press the **CLK** key.	Digital Display will show a blinking cursor in left-most digit position only.
22	Momentarily press 1434/1435 **DP** button.	**DP** indicator should light.
23	Momentarily press the 1434/1435 **TT** button.	**TT** indicator should light and **DP** indicator should go off.
24	Momentarily press the 1434/1435 **MF** button.	**MF** indicator should light and **TT** indicator should go off.
25	Momentarily press the 1434/1435 **ALT** button.	**ALT** indicator should light.
26	Momentarily press the 1434/1435 **CLR** button.	**CLR** indicator should be off. Digital display will show a blinking cursor in left-most digit position only (1434 only).
27	Momentarily press the 1434/1435 **HLD** button.	**HLD** indicator should light.
28	Enter 12 digits into the 1434/1435 dial pad.	Display should indicate digits entered on 1434, and **CLR** indicator should light.
29	Momentarily press the 1434/1435 **CLR** button.	**CLR** indicator should go off. Digital display should show a blinking cursor in left-most digit position (1434 only).

Table 2-4
Acceptance Procedures (Continued)

STEP	ACTION	VERIFICATION
30	Press the 1412C **VOM** button.	
31	Press the 1443C **150 VDC** and **ON** buttons. *Caution: Do not handle test cords/plugs, and do not have office equipment connected to breakdown voltage output, when* **BREAKDOWN** *button is pressed.*	
32	If office breakdown is connected to the Test Facility, press and release the 1443C **BRKDN BATT** button.	1443C meter should indicate correct breakdown voltage while the button is pressed.
33	Release the 1412C **VOM** button.	
34	Release the 1443C **150 VDC** and **ON** buttons.	
35	Press the 1462 **E /& M** button.	1462 **E & M** indicator should light.
36	Press the 1462 **SPLIT** button.	1462 **SPLIT** indicator should light.
37	Press the 1462 **PGM A** button.	1462 **PGM A** indicator should light.
38	Press the 1462 **PGM B** button.	1462 **PGM B** indicator should light, and 1462 **PGM A** indicator should go off.
39	Press the 1462 **DX** button.	1462 **DX** and **LONG LOOP** indicators should light, and the **E & M**, **SPLIT**, and **PGM B** indicators should go off.
40	Press the 1462 **SHORT LOOP** button.	1462 **SHORT LOOP** indicator should light.
41	Press the 1462 **SHORT LOOP** button.	1462 **SHORT LOOP** indicator should go off.
42	Press the 1462 **4W SX** button.	1462 **4W SX** indicator should light, and the **DX** indicator should go off.
43	Press the 1462 **SF** button (if the SF function is included int he Superivsion Module).	1462 **SF** indicator should light, and the **4W SX** indicator should go off.
44	Press the 1462 **LINE OFF HK** button.	1462 **LINE OFF HK** indicator should light.
45	Press the 1462 **LINE PULSE** button.	1462 **LINE PULSE** indicator should light.
46	Press the 1462 **LINE PULSE** button.	1462 **LINE PULSE** indicator should go off.
47	Press the 1462 **DROP OFF HK** button.	1462 **DROP OFF HK** indicator should light.
48	Press the 1462 **DROP PULSE** button.	1462 **DROP PULSE** indicator should light.

Table 2-4
Acceptance Procedures (Continued)

STEP	ACTION	VERIFICATION
49	Press the 1462 **4W SX** or **SF** button (whichever is lit).	1461 **4W SX** or **SF** indicator should go off.
50	Press the 1462 **RNG-B & G** button.	1462 **RNG-B & G** indicator, and the **LONG LOOP** indicator should light.
51	Press the 1462 **A-B REV** button.	1462 **A-B REV** indicator should light.
52	Press the 1462 **SIG TST** button.	1462 **SIG TST** indicator should light.
53	Press the 1462 **SIG TST** button.	1462 **SIG TST** indicator should go off.
54	On the 1462, press each button on which the indicator is lit.	All 1462 indicators should be off.
55	Originate and receive a call on each of the Communication Module tel lines. Use different signaling modes when originating calls.	
56	Perform all of the test procedures in Volume 1 of this manual that are applicable to the office.	

DRAWING INDEX

CONTENTS	NUMBER J1400-	NUMBER OF DRAWINGS	REVISION	PAGE
J DRAWING INDEX	000	1	H	3-1
CONFIGURATION DRAWING	001	3	E	3-2
EQUIPMENT LISTS	002	3	F	3-5
1402 TEST FACILITY SHELF	003	1	A	3-8
1403 TEST FACILITY SHELF	004	1	A	3-9
1412C ACCESS MODULE	005	1	C	3-10
1422 COMMUNICATION MODULE	006	1	C	3-11
1434 SIGNAL MODULE	007	1	D	3-12
1435 SIGNAL MODULE	008	1	D	3-13
1443C VOM MODULE	009	1	C	3-14
1462 SUPERVISION MODULE	010	1	B	3-15
CR-111B CORD REEL PANEL	011	1	B	3-16
MISCELLANEOUS JACKFIELDS	012	1	B	3-17

REVISION HISTORY

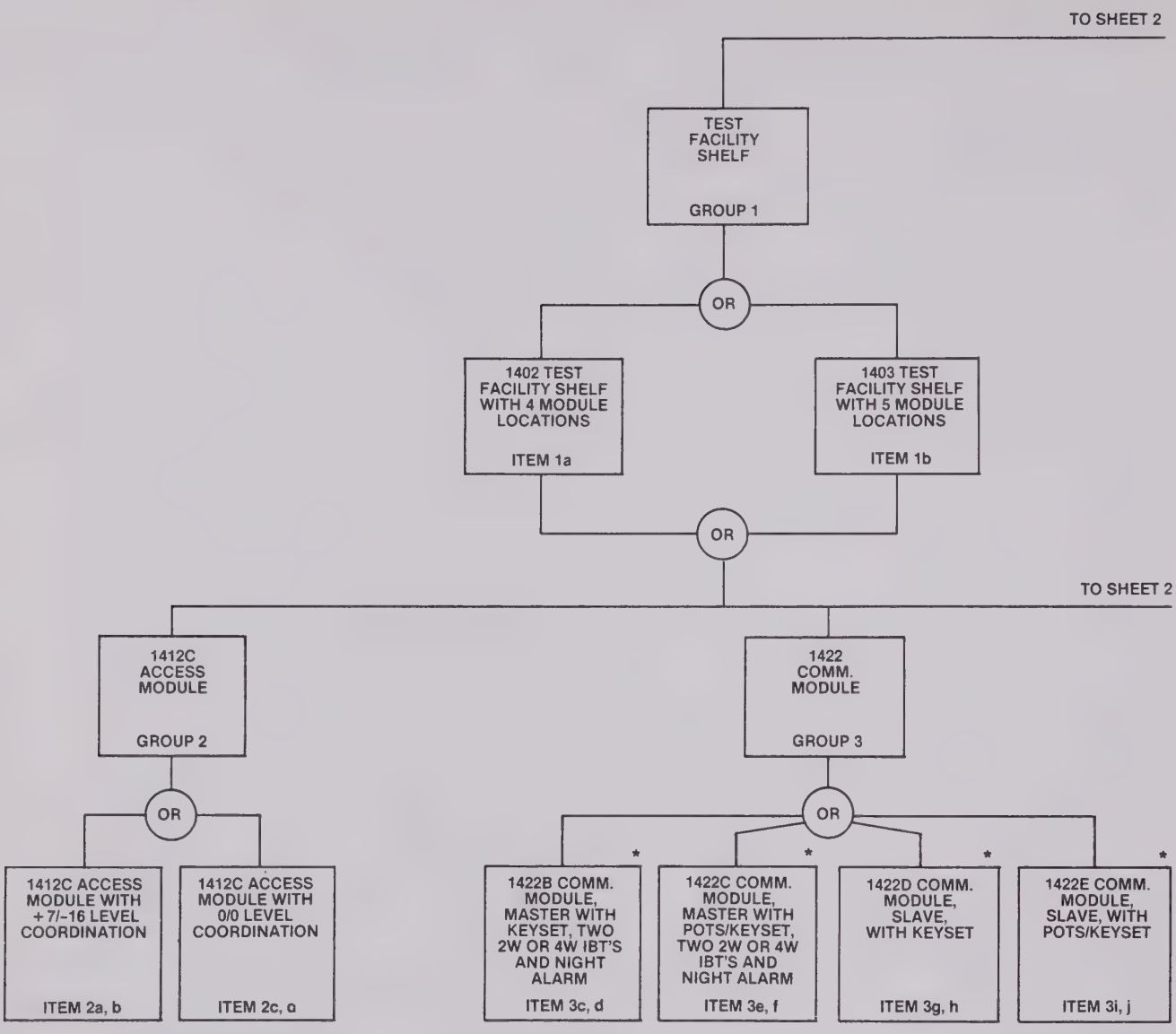
REVISION	ECO	DATE	REASON FOR CHANGE
A		7/77	INITIAL RELEASE
B		11/79	ELIMINATED FOLDOUTS
C		4/81	DELETED 1430 MODULE
D		11/82	ADDED 1461 AND 1462 SUPERVISION MODULE, AND DELETED 1460 SUPERVISION MODULE
E		12/83	REPLACED 1412C, 1422, 1432, 1433, 1443C MODULE FIGURES TO DEPICT NEW FRONT PANEL LAYOUTS
F		5/84	INCORPORATED 1461 AND 1462 SF PRINTED CIRCUIT BOARD REDESIGN CHANGES
G		11/84	DELETED 1461 MODULE
H		3/86	DELETED 1432 AND 1433 SIGNAL MODULES AND ADDED 1434 AND 1435 SIGNAL MODULES

NOTES:

1. THE DRAWING INDEX REVISION LEVEL REFLECTS THE LATEST REVISION TO THE ENTIRE DRAWING SET AND WILL BE CHANGED EACH TIME ONE OR MORE DRAWINGS IS REVISED.
2. ONLY DRAWINGS AFFECTED BY A CHANGE WILL BE REVISED; THE REVISION LEVEL OF EACH DRAWING REFLECTS THE LATEST APPLICABLE CHANGE TO THAT DRAWING

1400 TEST FACILITY
J DRAWING INDEX

DRAWING NUMBER	REVISION	SHEET
J1400-000	H	1 OF 1


TO SHEET 2
TEST FACILITY SHELF
GROUP 1
OR
1402 TEST FACILITY SHELF WITH 4 MODULE LOCATIONS
ITEM 1a
1403 TEST FACILITY SHELF WITH 5 MODULE LOCATIONS
ITEM 1b
OR
TO SHEET 2
1412C ACCESS MODULE
GROUP 2
1422 COMM. MODULE
GROUP 3
OR
OR
1412C ACCESS MODULE WITH +7/-16 LEVEL COORDINATION
ITEM 2a, b
1412C ACCESS MODULE WITH 0/0 LEVEL COORDINATION
ITEM 2c, a
1422B COMM. MODULE, MASTER WITH KEYSET, TWO 2W OR 4W IBT'S AND NIGHT ALARM
ITEM 3c, d
1422C COMM. MODULE, MASTER WITH POTS/KEYSET, TWO 2W OR 4W IBT'S AND NIGHT ALARM
ITEM 3e, f
1422D COMM. MODULE, SLAVE, WITH KEYSET
ITEM 3g, h
1422E COMM. MODULE, SLAVE, WITH POTS/KEYSET
ITEM 3i, j
* 1422 MODULES CAN ALSO BE PROGRAMMED FOR 101 TRUNKS.

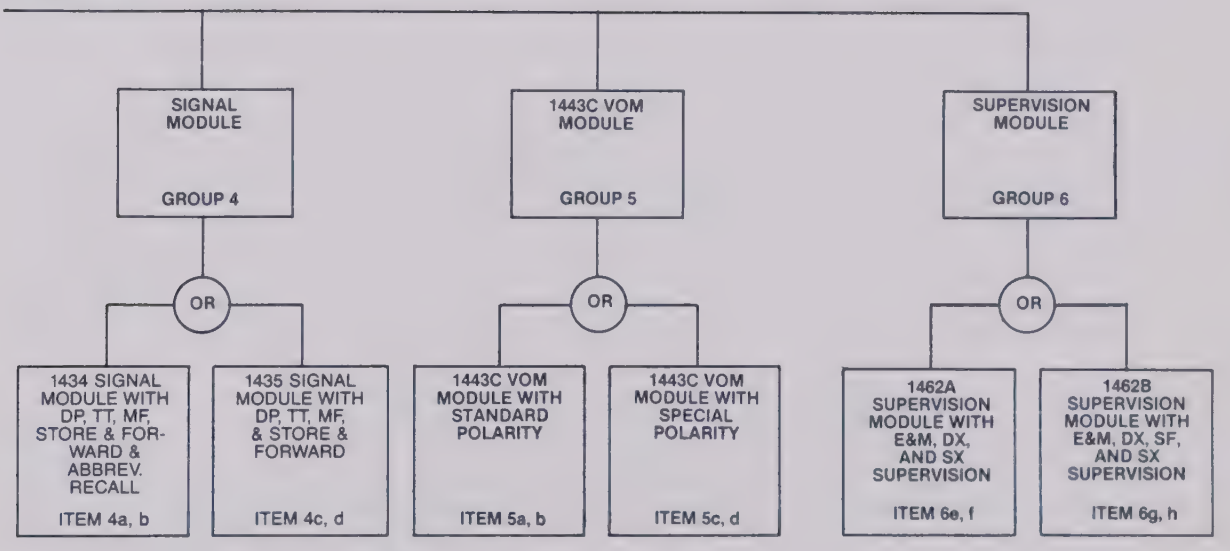
NOTE: ITEM AND GROUP NUMBERS REFER TO EQUIPMENT LISTS J1400-002

1400 TEST FACILITY CONFIGURATION DRAWING		
DRAWING NUMBER	REVISION	SHEET
J1400-001	E	1 OF 3

FROM SHEET 1

TO SHEET 3

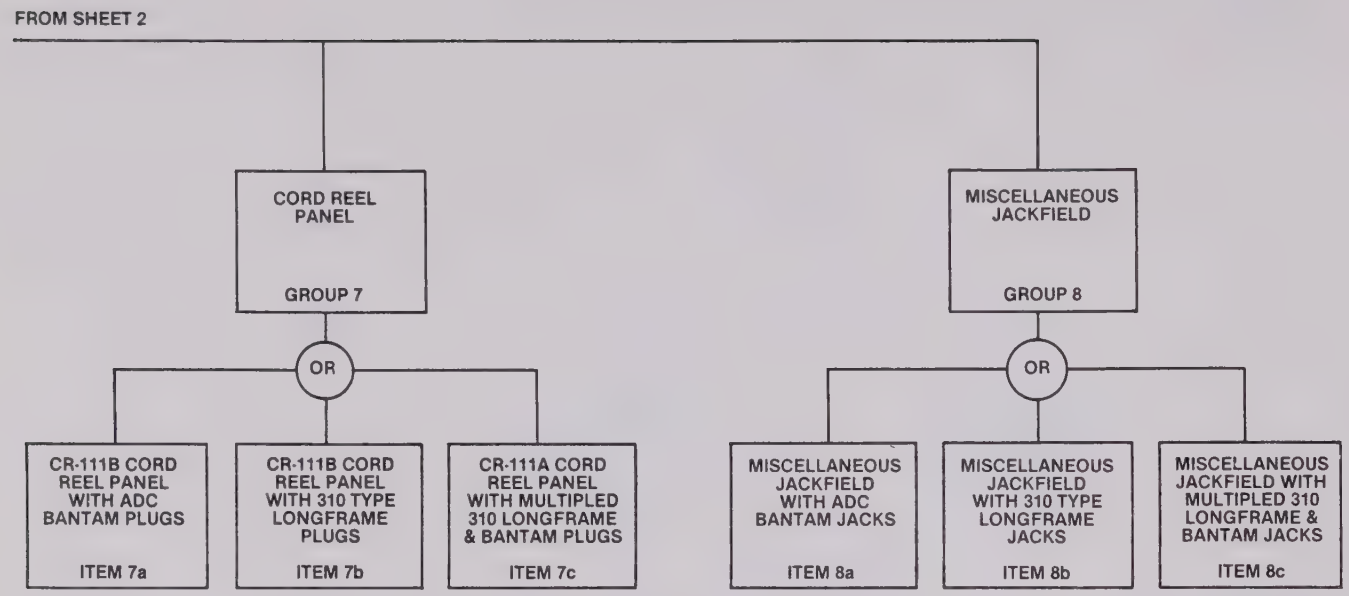
FROM SHEET 1


SIGNAL MODULE
GROUP 4
OR
1434 SIGNAL MODULE WITH DP, TT, MF, STORE & FOR-WARD & ABBREV. RECALL
ITEM 4a, b
1435 SIGNAL MODULE WITH DP, TT, MF, & STORE & FORWARD
ITEM 4c, d
1443C VOM MODULE
GROUP 5
OR
1443C VOM MODULE WITH STANDARD POLARITY
ITEM 5a, b
1443C VOM MODULE WITH SPECIAL POLARITY
ITEM 5c, d
SUPERVISION MODULE
GROUP 6
OR
1462A SUPERVISION MODULE WITH E&M, DX, AND SX SUPERVISION
ITEM 6e, f
1462B SUPERVISION MODULE WITH E&M, DX, SF, AND SX SUPERVISION
ITEM 6g, h

NOTE: ITEM AND GROUP NUMBERS REFER TO EQUIPMENT LISTS J1400-002

1400 TEST FACILITY
CONFIGURATION DRAWING

DRAWING NUMBER	REVISION	SHEET
J1400-001	E	2 OF 3


FROM SHEET 2
CORD REEL PANEL
GROUP 7
MISCELLANEOUS JACKFIELD
GROUP 8
OR
OR
CR-111B CORD REEL PANEL WITH ADC BANTAM PLUGS
ITEM 7a
CR-111B CORD REEL PANEL WITH 310 TYPE LONGFRAME PLUGS
ITEM 7b
CR-111A CORD REEL PANEL WITH MULTIPLED 310 LONGFRAME & BANTAM PLUGS
ITEM 7c
MISCELLANEOUS JACKFIELD WITH ADC BANTAM JACKS
ITEM 8a
MISCELLANEOUS JACKFIELD WITH 310 TYPE LONGFRAME JACKS
ITEM 8b
MISCELLANEOUS JACKFIELD WITH MULTIPLED 310 LONGFRAME & BANTAM JACKS
ITEM 8c

NOTE: ITEM AND GROUP NUMBERS REFER TO EQUIPMENT LISTS J1400-002

1400 TEST FACILITY CONFIGURATION DRAWING		
DRAWING NUMBER J1400-001	REVISION E	SHEET 3 OF 3

1400 TEST FACILITY EQUIPMENT LIST

ITEM	DESCRIPTION	PART/GROUP NO.	NOTES*
1	TEST FACILITY SHELF	GROUP 1	1
2	1412C ACCESS MODULE	GROUP 2	2
3	1422 COMMUNICATION MODULE	GROUP 3	3
4	SIGNAL MODULE	GROUP 4	4
5	1443C VOM MODULE	GROUP 5	4
6	SUPERVISION MODULE	GROUP 6	4
7	CORD REEL PANEL	GROUP 7	4, 5
8	MISCELLANEOUS JACKFIELD	GROUP 8	4, 5

1400 TEST FACILITY GROUP 1 (TEST FACILITY SHELF)

ITEM	DESCRIPTION	PART NUMBER	NOTES*
1a	1402 TEST FACILITY SHELF WITH FOUR MODULE LOCATIONS	2-32760-0020	5
1b	1403 TEST FACILITY SHELF WITH FIVE MODULE LOCATIONS	2-33210-0020	6

1400 TEST FACILITY GROUP 2 (1412C ACCESS MODULE)

ITEM	DESCRIPTION	PART NUMBER	NOTES*
2a	1412C WITH +7/−16 dBm LEVEL COORDINATION	2-42930-0512	
2b	1412C WITH 0/0 dBm LEVEL COORDINATION	2-42930-0514	

*NOTES ON SHEET 4

1400 TEST FACILITY GROUP 3 (1422 COMMUNICATION MODULE

ITEM	DESCRIPTION	NOTES*
3a	1422B COMMUNICATION MODULE, MASTER, KEYSET ONLY, TWO 2-WIRE OR 4-WIRE IBT'S, AND NIGHT ALARM	4, 10
3b	1422C COMMUNICATION MODULE, MASTER, PROGRAMMABLE (POTS OR KEYSET), TWO 2-WIRE OR 4-WIRE IBT'S, AND NIGHT ALARM	4, 10
3c	1422D COMMUNICATION MODULE, SLAVE, KEYSET ONLY	7, 10
3e	1422E COMMUNICATION MODULE, SLAVE, PROGRAMMABLE (POTS OR KEYSET)	7, 10

1400 TEST FACILITY EQUIPMENT LISTS		
DRAWING NUMBER J1400-002	REVISION F	SHEET 1 OF 3

1400 TEST FACILITY GROUP 4 (SIGNAL MODULE)

ITEM	DESCRIPTION	NOTES*
4a	1434 SIGNAL MODULE WITH DP, TT®, MF, STORE AND FORWARD, AND ABBREVIATED RECALL	4
4b	1435 SIGNAL MODULE WITH DP, TT®, MF STORE AND FORWARD, AND ABBREVIATED RECALL	4

*NOTES ON SHEET 4

1400 TEST FACILITY GROUP 5 (1443C VOM MODULE)

ITEM	DESCRIPTION	NOTES*
5a	1443C VOM MODULE WITH STANDARD POLARITY	4
5b	1443C VOM MODULE WITH SPECIAL POLARITY	4

1400 TEST FACILITY GROUP 6 (SUPERVISION MODULE)

ITEM	DESCRIPTION	NOTES*
6a	1462A SUPERVISION MODULE WITH E & M, DX, AND SX SUPERVISION, AND DIRECT RINGING	4
6b	1462B SUPERVISION MODULE WITH E & M, DX, SF, AND SX SUPERVISION, AND DIRECT RINGING	4

*NOTES ON SHEET 4

1400 TEST FACILITY GROUP 7 (CORD REEL PANEL)

ITEM	DESCRIPTION	NOTES*
7a	CR-111B CORD REEL PANEL WITH ADC BANTAM PLUGS	4, 5, 8
7b	CR-111B CORD REEL PANEL WITH 310 TYPE LONGFRAME PLUGS	4, 5, 8
7c	CR-111A CORD REEL PANEL WITH MULTIPLED 310 LONGFRAME AND ADC BANTAM PLUGS	4, 5, 8

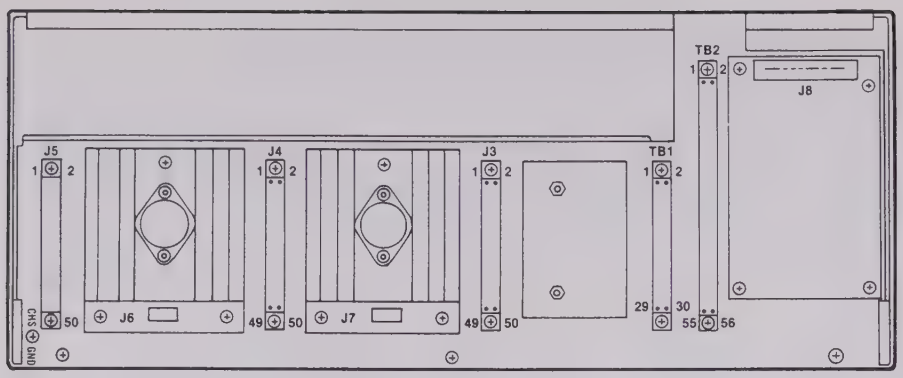
1400 TEST FACILITY GROUP 8 (MISCELLANEOUS JACKFIELD)

ITEM	DESCRIPTION	NOTES*
8a	MISCELLANEOUS JACKFIELD WITH TWO ROWS OF ADC BANTAM JACKS	4, 6, 9
8b	MISCELLANEOUS JACKFIELD WITH TWO ROWS OF MULTIPLED JACKS; UPPER ROW 310 TYPE LONGFRAME JACKS, LOWER ROW ADC BANTAM JACKS	4, 6, 9
8c	MISCELLANEOUS JACKFIELD WITH TWO ROWS OF 310 TYPE LONGFRAME JACKS	4, 6, 9

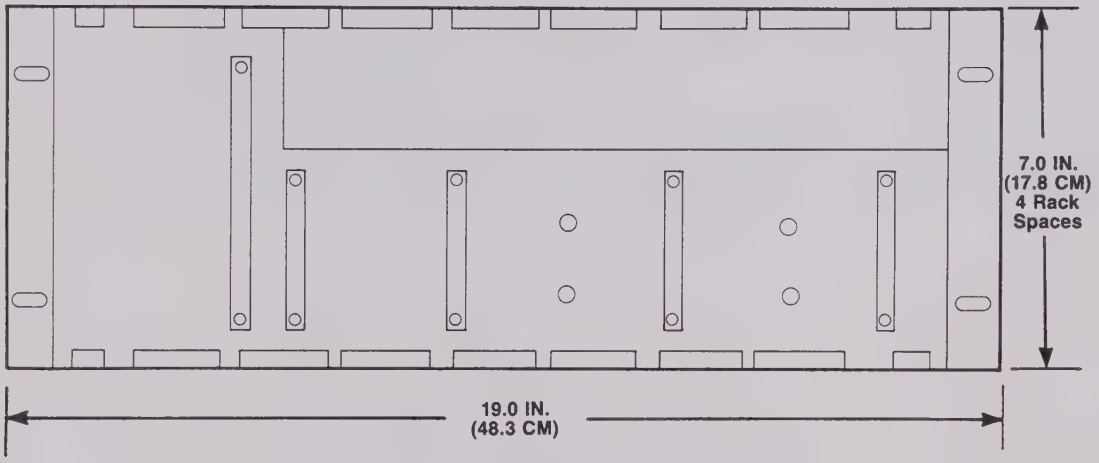
NOTES

1. ONE OF TWO ITEMS IN THE GROUP IS REQUIRED PART OF ANY 1400 TEST FACILITY.
2. REQUIRED PART OF ANY 1400 TEST FACILITY.
3. ONE OR MORE MAY BE CONTAINED IN ANY 1400 TEST FACILITY.
4. OPTIONAL WITH ANY 1400 TEST FACILITY.
5. USED IN 19″ OR 23″ RACKS. 19″ TO 23″ ADAPTER BRACKETS ARE INCLUDED AS REQUIRED.
6. USED IN 23″ RACKS ONLY.
7. OPTIONAL ONLY IF TEST FACILITY CONTAINS A MASTER 1422 (ITEM 3a, 3b, or 3c).
8. OTHER CORD REEL PANEL CONFIGURATIONS AVAILABLE.
9. OTHER MISCELLANEOUS JACKFIELD CONFIGURATIONS AVAILABLE.
10. CAN ALSO BE PROGRAMMED FOR 101 TRUNKS.

1400 TEST FACILITY EQUIPMENT LISTS		
DRAWING NUMBER J1400-002	REVISION F	SHEET 3 OF 3



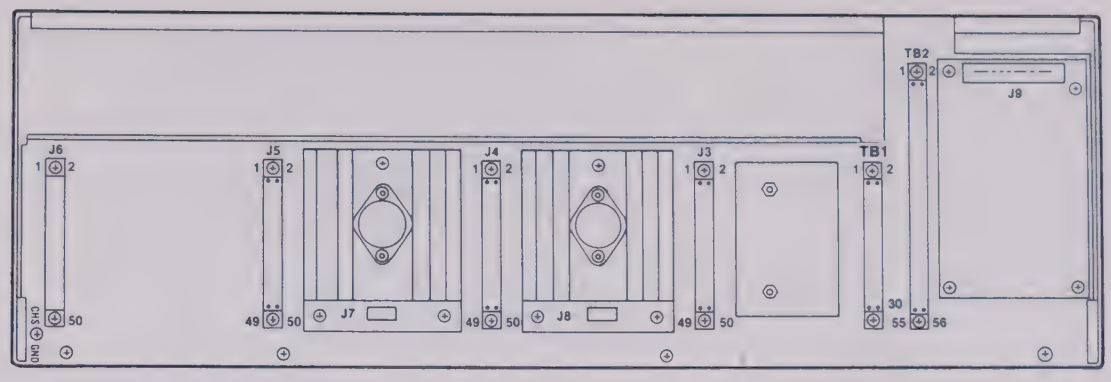
REAR VIEW



FRONT VIEW

NOTE:
EXTENDER BRACKETS PROVIDED FOR 23 IN. RACKS

1400 TEST FACILITY 1402 TEST FACILITY SHELF		
DRAWING NUMBER J1400-003	REVISION A	SHEET 1 OF 1



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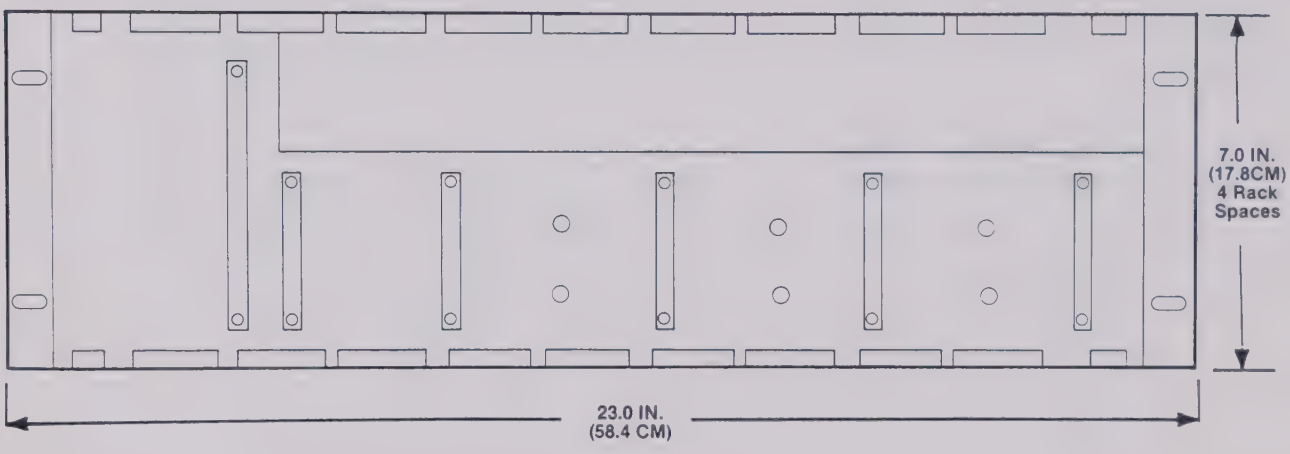
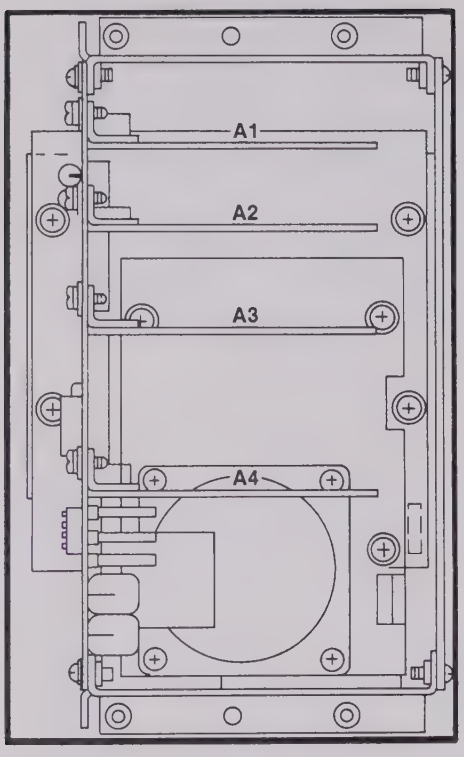


FRONT VIEW

1400 TEST FACILITY 1403 TEST FACILITY SHELF		
DRAWING NUMBER J1400-004	REVISION A	SHEET 1 OF 1



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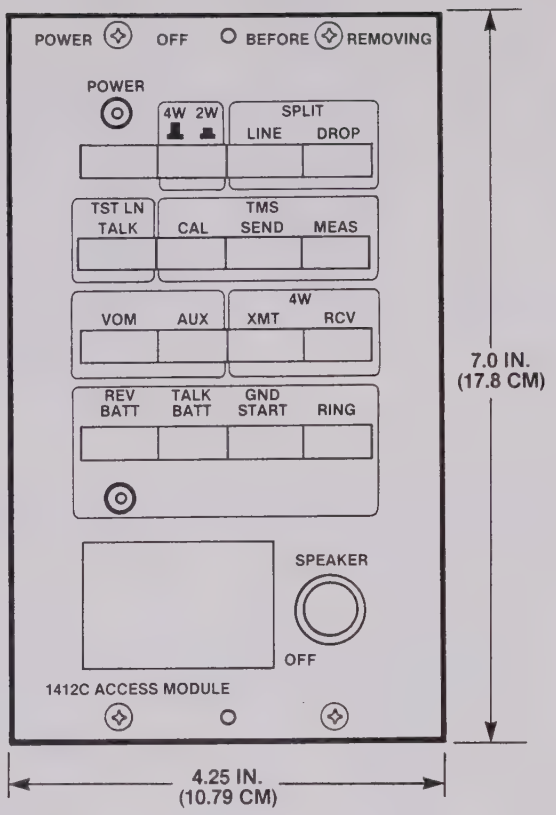
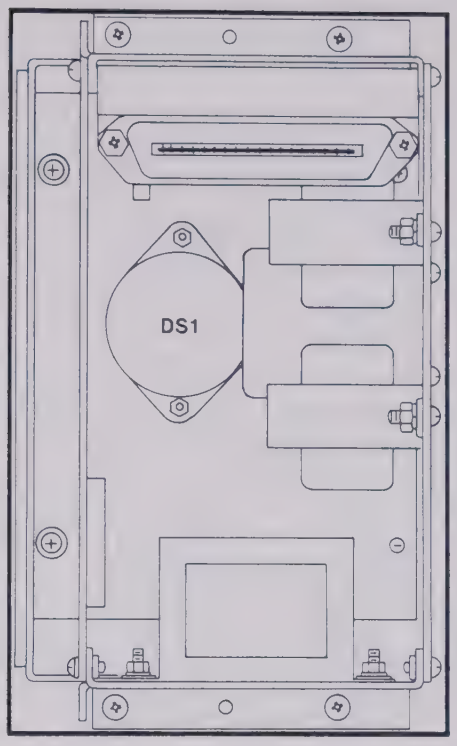
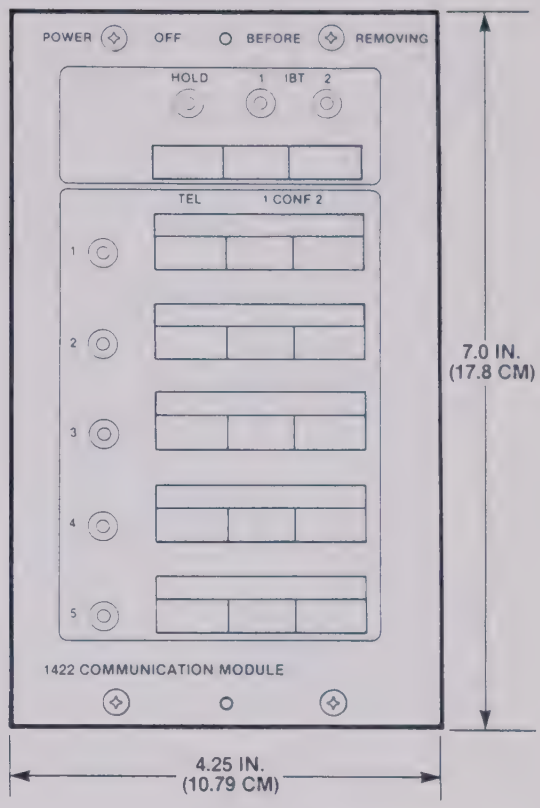


FRONT VIEW

1400 TEST FACILITY 1412C ACCESS MODULE		
DRAWING NUMBER J1400-005	REVISION C	SHEET 1 OF 1

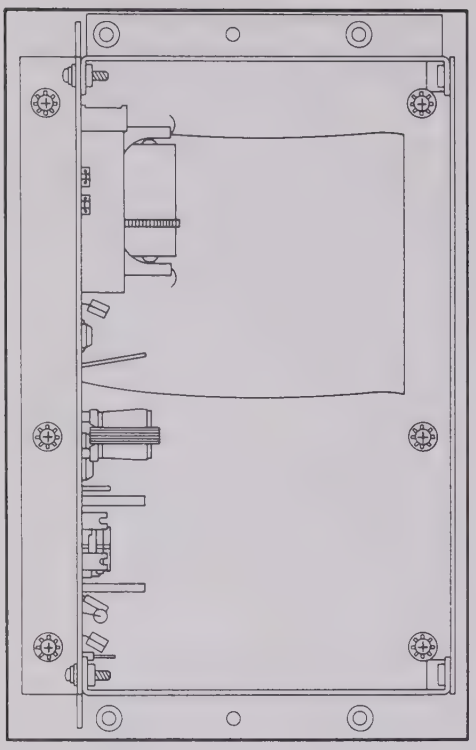


REAR VIEW

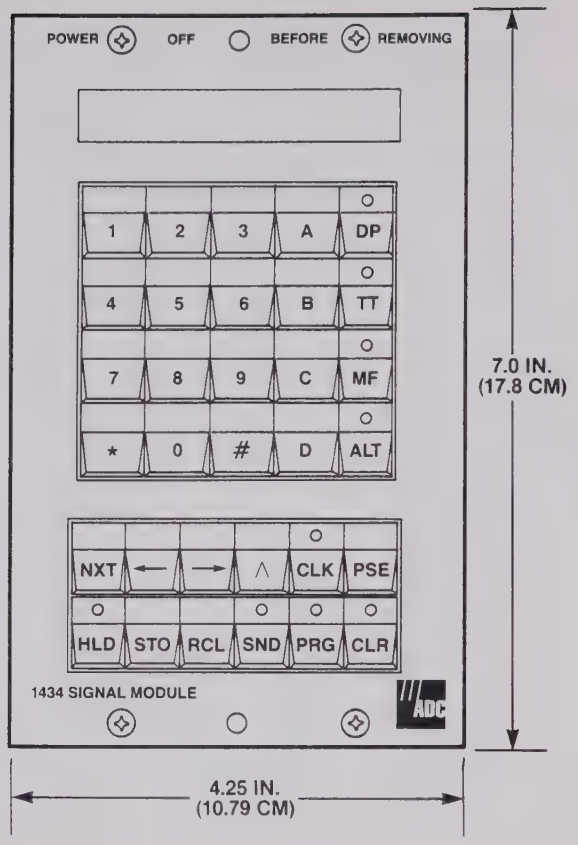


FRONT VIEW

1400 TEST FACILITY 1422 COMMUNICATION MODULE		
DRAWING NUMBER J1400-006	REVISION C	SHEET 1 OF 1

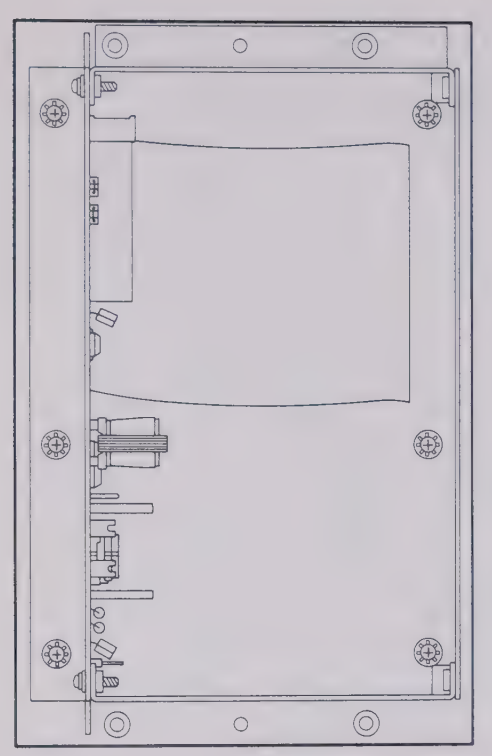


REAR VIEW

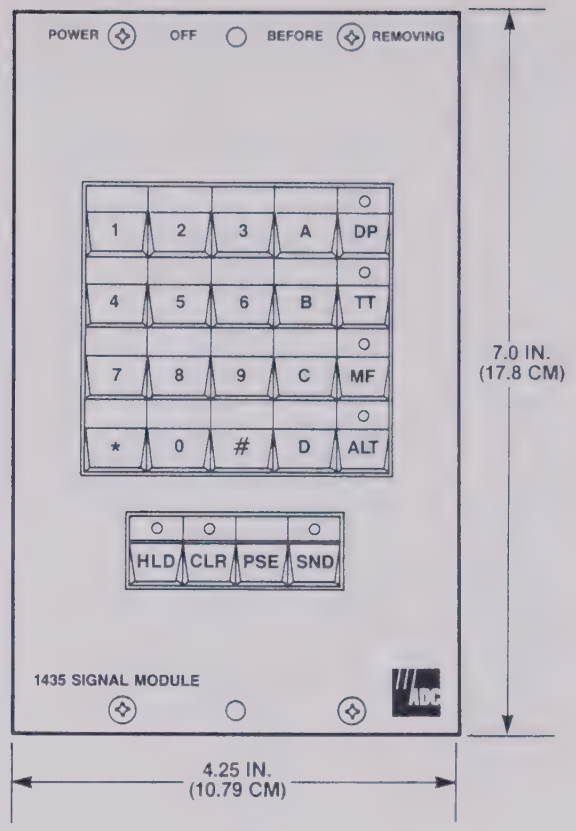


FRONT VIEW

ADC		
1400 TEST FACILITY 1434 SIGNAL MODULE		
DRAWING NUMBER J1400-007	REVISION D	SHEET 1 OF 1

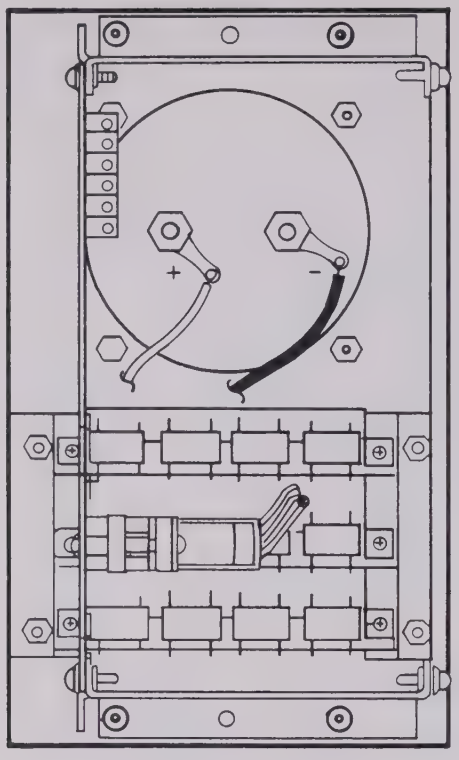


REAR VIEW

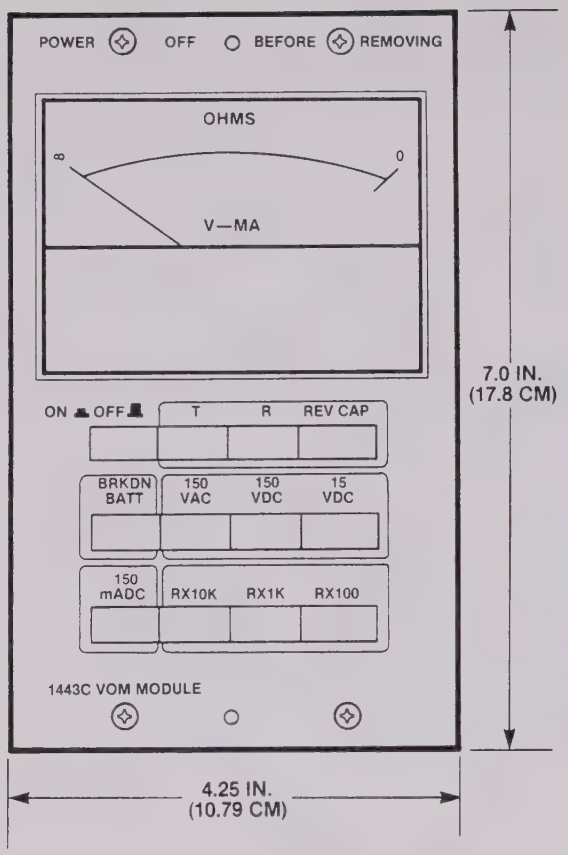


FRONT VIEW

1400 TEST FACILITY 1435 SIGNAL MODULE		
DRAWING NUMBER J1400-008	REVISION D	SHEET 1 OF 1

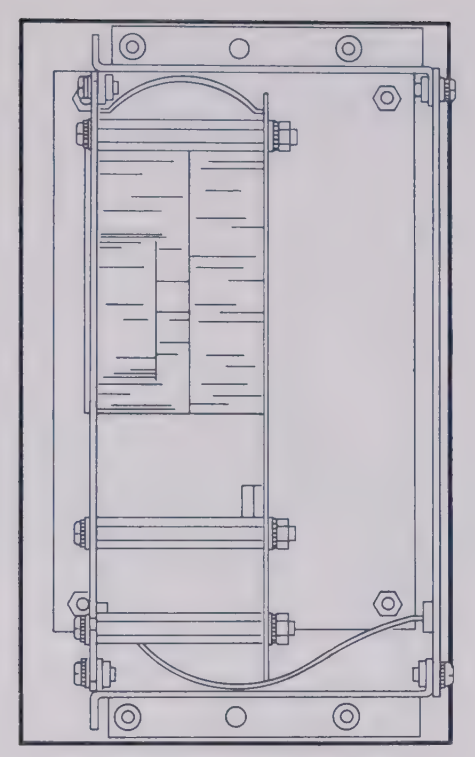


REAR VIEW

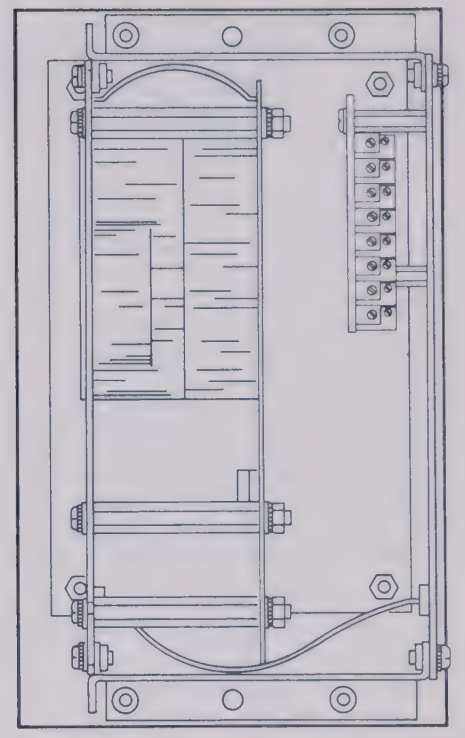


FRONT VIEW

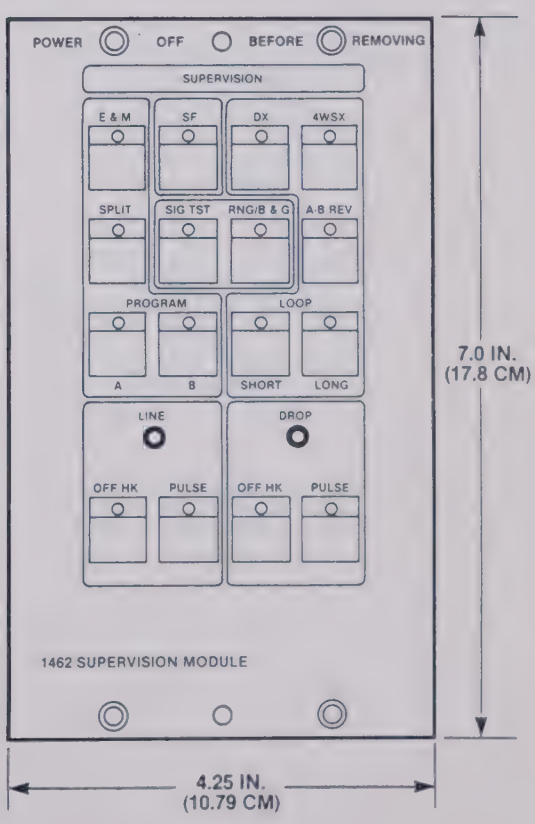
1400 TEST FACILITY 1443C VOM MODULE		
DRAWING NUMBER J1400-009	REVISION C	SHEET 1 OF 1



REAR VIEW

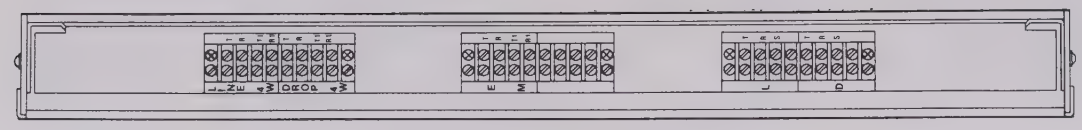


REAR VIEW WITH FOUR-WAY SF CARD

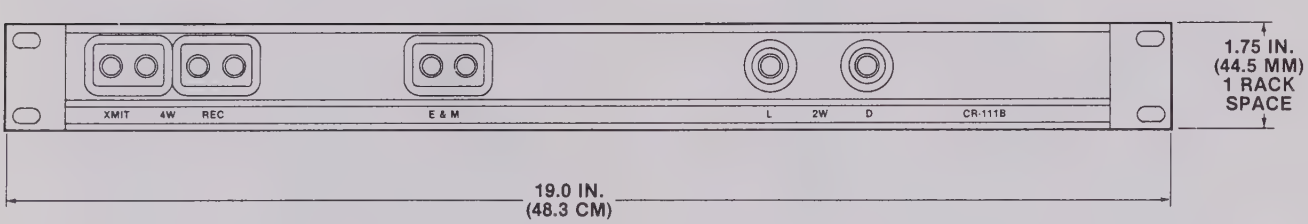


FRONT VIEW

1400 TEST FACILITY 1462 SUPERVISION MODULE		
DRAWING NUMBER J1400-010	REVISION B	SHEET 1 OF 1



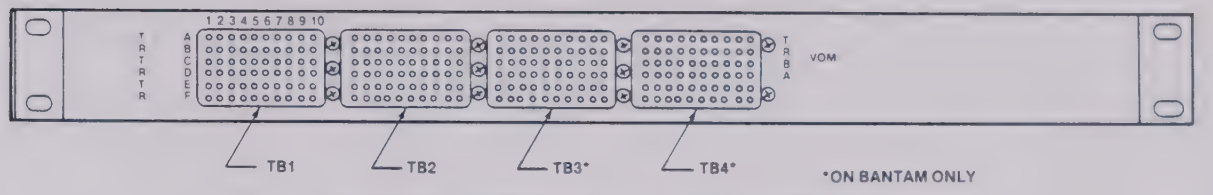
REAR VIEW



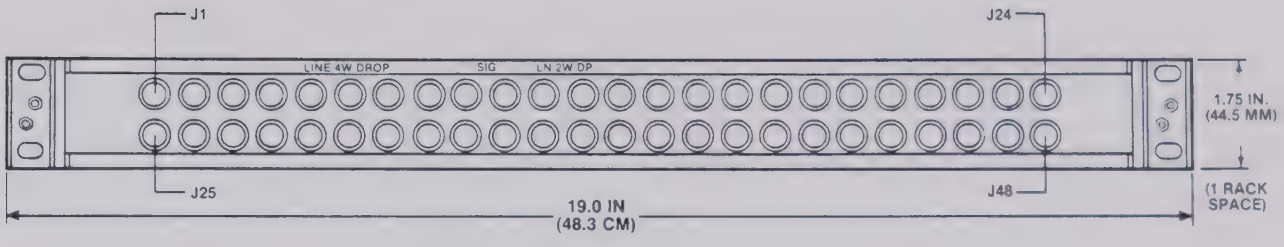
FRONT VIEW

NOTE:
EXTENDER BRACKETS PROVIDED FOR 23 IN. RACKS

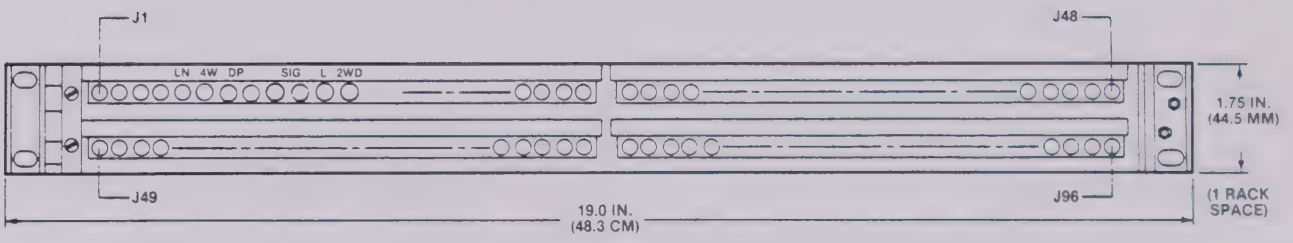
1400 TEST FACILITY CR-111B CORD REEL PANEL, 310 LONGFRAME		
DRAWING NUMBER J1400-011	REVISION B	SHEET 1 OF 1



REAR VIEW—LONGFRAME AND BANTAM JACKFIELDS



FRONT VIEW—LONGFRAME JACKFIELD



FRONT VIEW—BANTAM JACKFIELD

NOTE:
EXTENDER BRACKETS PROVIDED FOR 23 IN. RACKS

1400 TEST FACILITY MISCELLANEOUS JACKFIELDS, 310 LONGFRAME AND ADC BANTAM		
DRAWING NUMBER J1400-012	REVISION B	SHEET 1 OF 1

DRAWING INDEX

CONTENTS	NUMBER T1400-	NUMBER OF DRAWINGS	REVISION	PAGE
T DRAWING INDEX	000	1	F	4-1
TEST FACILITY CABLING	001	1	E	4-2
POWER DISTRIBUTION	002	1	E	4-3
CABLE ASSIGNMENT DRAWINGS	003	18	E	4-4
TERMINAL BLOCK/CONNECTOR DRAWINGS	004	5	D	4-22

REVISION HISTORY

REVISION	ECO	DATE	REASON FOR CHANGE
A		7/77	INITIAL RELEASE
B		11/79	ELIMINATED FOLDOUTS
C		4/81	DELETED 1430 MODULE AND RE-NUMBERED CAD'S
D		11/82	ADDED 1460 MODULE AND ADDED 1461 AND 1462 MODULES
E		11/84	DELETED 1461 SUPERVISION MODULE
F		3/86	DELETED 1432 AND 1433 SIGNAL MODULES AND ADDED 1434 AND 1435 SIGNAL MODULES

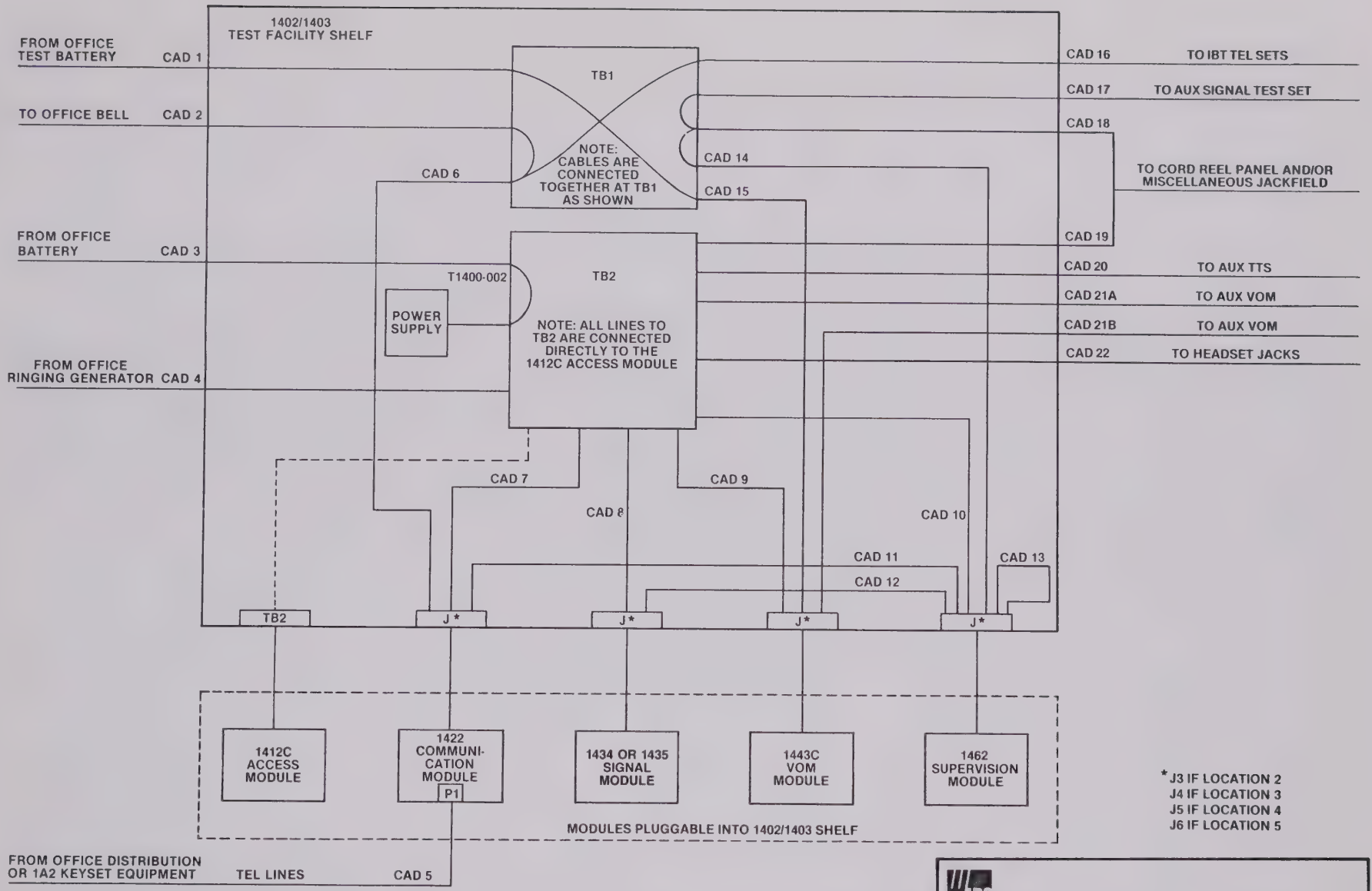
NOTES:

1. THE DRAWING INDEX REVISION LEVEL REFLECTS THE LATEST REVISION TO THE ENTIRE DRAWING SET AND WILL BE CHANGED EACH TIME ONE OR MORE DRAWINGS IS REVISED.
2. ONLY DRAWINGS AFFECTED BY A CHANGE WILL BE REVISED; THE REVISION LEVEL OF EACH DRAWING REFLECTS THE LATEST APPLICABLE CHANGE TO THAT DRAWING

ADC

1400 TEST FACILITY
T DRAWING INDEX

DRAWING NUMBER	REVISION	SHEET
T1400-000	F	1 OF 1

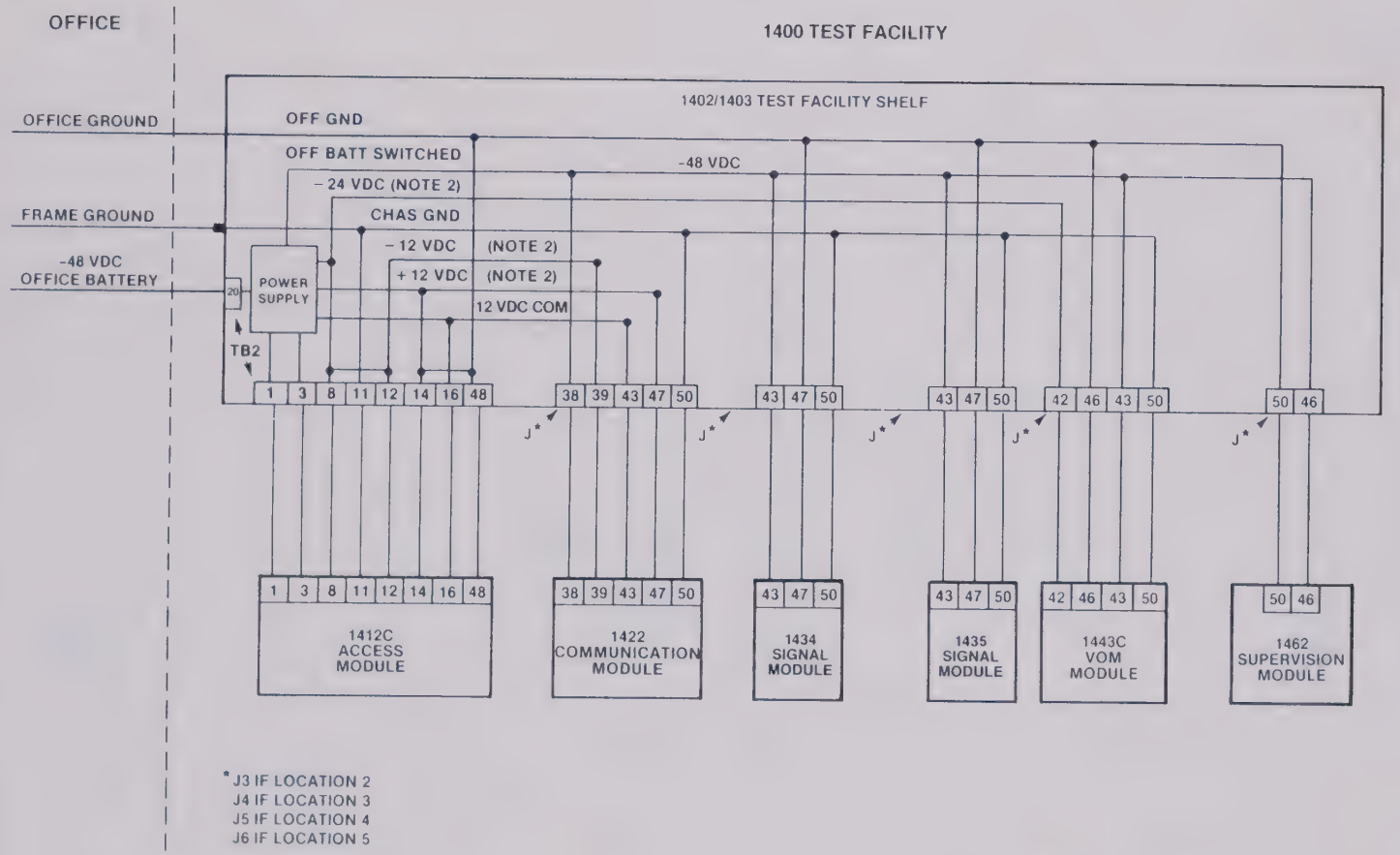


*J3 IF LOCATION 2
J4 IF LOCATION 3
J5 IF LOCATION 4
J6 IF LOCATION 5

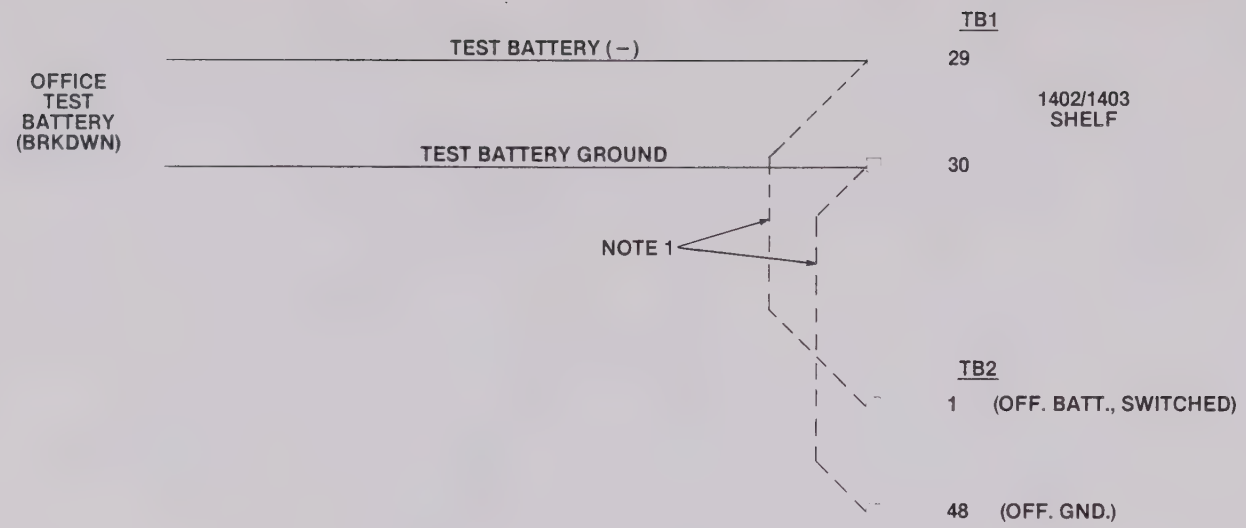
ADC

1400 TEST FACILITY CABLING DIAGRAM

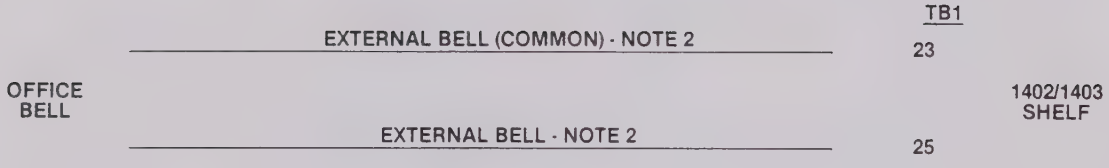
DRAWING NUMBER	REVISION	SHEET
T1400-001	E	1 OF 1



1400 TEST FACILITY POWER DISTRIBUTION		
DRAWING NUMBER T1400-002	REVISION E	SHEET 1 OF 1



CAD 1

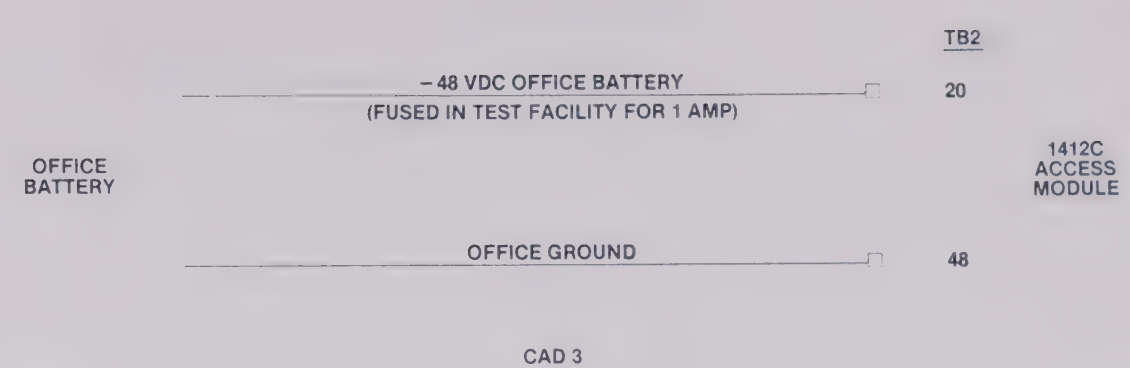


CAD 2

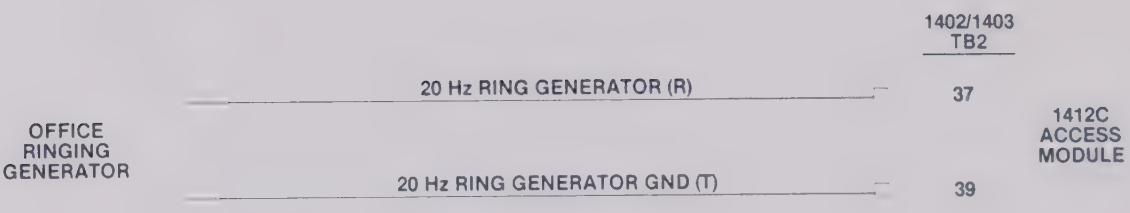
NOTE 1: IF 48 VDC IS DESIRED FOR TEST BATTERY, JUMPERS ARE ADDED BETWEEN TB1 AND TB2 AS SHOWN.
CAUTION: EXTERNAL TEST BATTERY MUST NOT BE CONNECTED IF JUMPERS ARE ADDED.

NOTE 2: CONNECTED ONLY IF TEST FACILITY CONTAINS A 1422 COMMUNICATION MODULE.

1400 TEST FACILITY CABLE ASSIGNMENT DRAWINGS (CAD'S)		
DRAWING NUMBER T1400-003	REVISION E	SHEET 1 OF 18

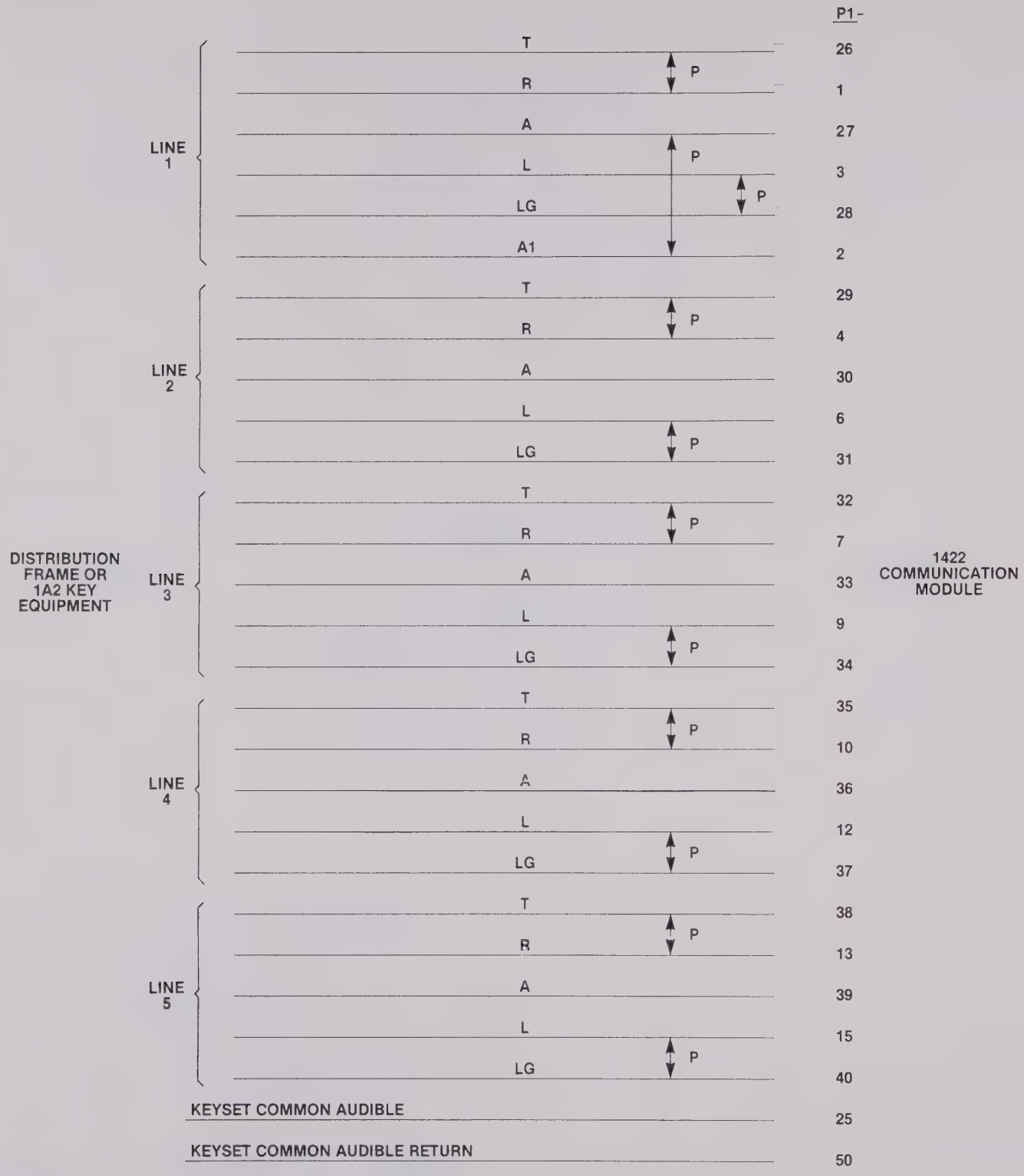


CAD 3



CAD 4

1400 TEST FACILITY CABLE ASSIGNMENT DRAWINGS (CAD'S)		
DRAWING NUMBER T1400-003	REVISION E	SHEET 2 OF 18



CAD 5

P = TWISTED PAIR

1400 TEST FACILITY CABLE ASSIGNMENT DRAWINGS (CAD'S)		
DRAWING NUMBER	REVISION	SHEET
T1400-003	E	3 OF 18

TEL LINE CONNECTIONS

RING IN/DIAL OUT (POTS)—SINGLE FACILITY INSTALLATION

1. TIP AND RING ARE CONNECTED FOR EACH POTS LINE.
2. ALL POTS LINE A1 LEADS ARE MULTIPLED AND CONNECTED TO P1-2.

RING IN/DIAL OUT (POTS)—MULTIPLE FACILITY INSTALLATION

1. ALL POTS LINE TIP, RING, A AND L LEADS ARE CONNECTED TO EACH FACILITY.
2. ALL POTS LINE A1 LEADS ARE MULTIPLED AND CONNECTED TO P1-2 OF EACH FACILITY.

1A2 KEYSET INSTALLATION

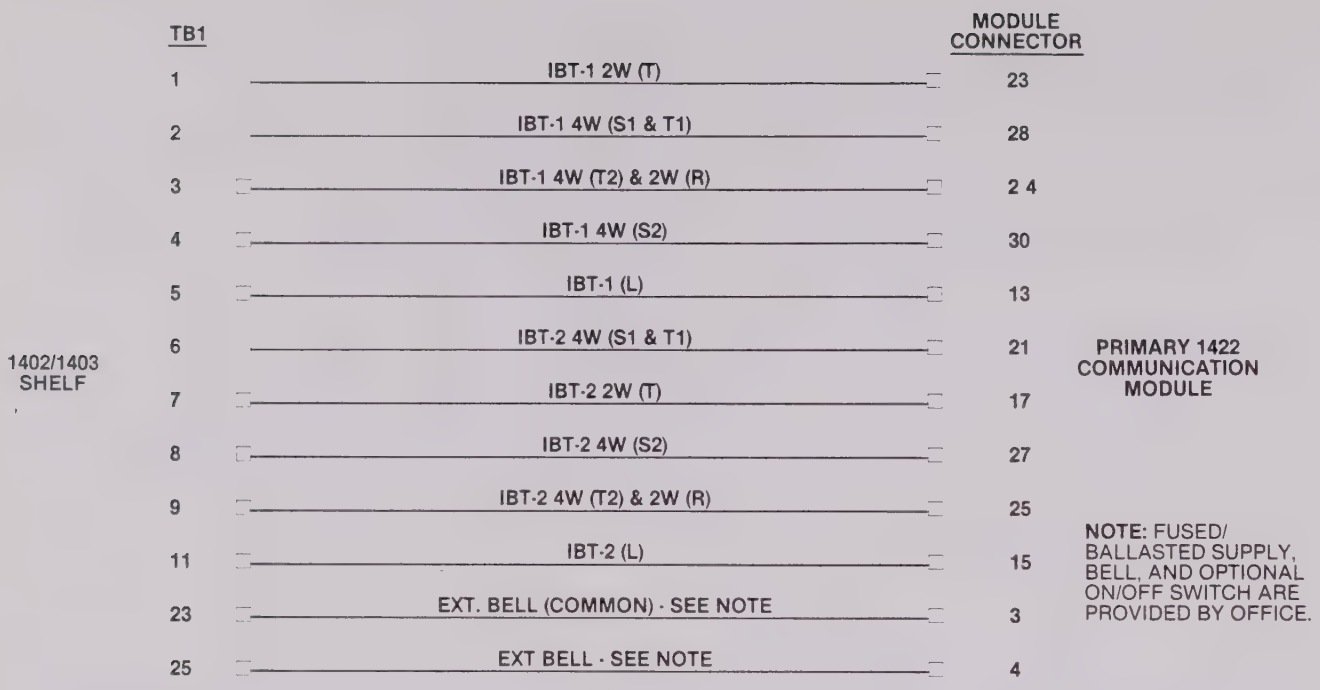
1. ALL LINES ARE CONNECTED AS SHOWN.
2. E7 IS STRAPPED TO E8 ON THE 1422 CUSTOMER CONNECTOR BOARD IF THE A1 LEADS ARE NOT GROUNDED IN THE KSU.
   NOTE: E7 MUST NOT BE STRAPPED TO E8 IF THE A1 LEADS ARE GROUNDED IN THE KSU. THE STRAP WOULD RESULT IN A GROUND LOOP AND CAUSE A HUMMING CONDITION.

CAD 5 (CONTINUED)

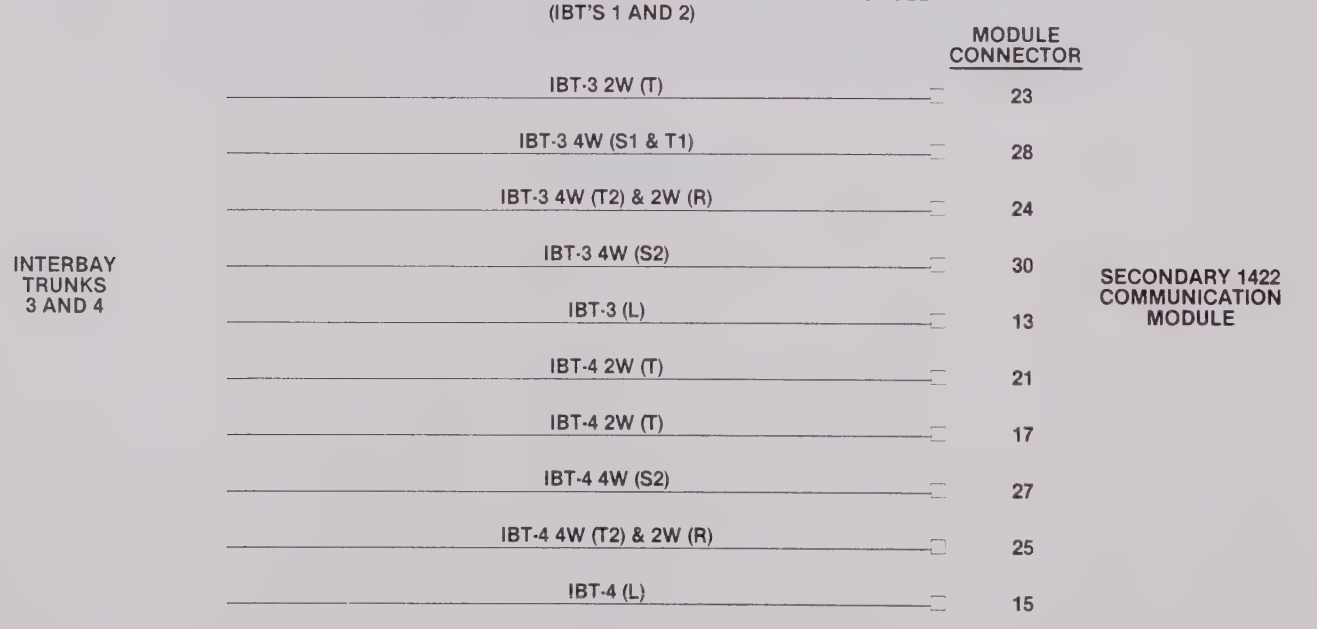
ADC

1400 TEST FACILITY
CABLE ASSIGNMENT DRAWINGS (CAD'S)

DRAWING NUMBER	REVISION	SHEET
T1400-003	E	4 OF 18



CAD 6A
CONNECTIONS TO PRIMARY 1422 COMMUNICATION MODULE
(IBT'S 1 AND 2)

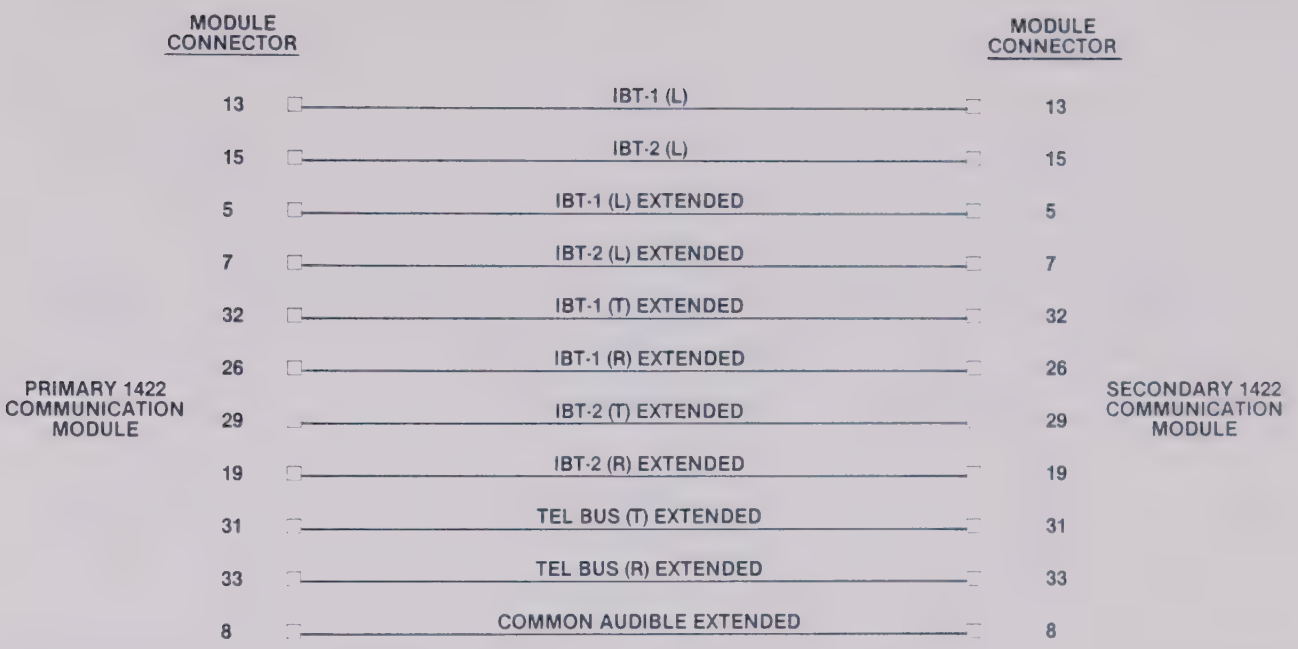


CAD 6B
CONNECTIONS TO SECONDARY 1422 COMMUNICATION MODULE
(IBT'S 3 AND 4)

CAD 6

1400 TEST FACILITY
CABLE ASSIGNMENT DRAWINGS (CAD'S)

DRAWING NUMBER	REVISION	SHEET
T1400-003	E	5 OF 18

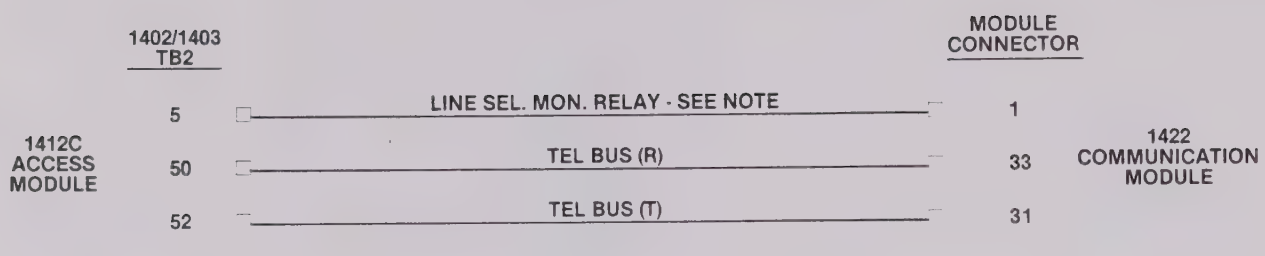


CAD 6C
CONNECTIONS TO EXTEND IBT'S FROM PRIMARY TO SECONDARY
1422 COMMUNICATION MODULES

CAD 6 (CONTINUED)

1400 TEST FACILITY
CABLE ASSIGNMENT DRAWINGS (CAD'S)

DRAWING NUMBER	REVISION	SHEET
T1400-003	E	6 OF 18



CAD 7

NOTE: LINE SEL MON. RELAY LINE IS CONNECTED TO ALL 1422 MODULES CONTAINED IN THE TEST FACILITY.

ADC		
1400 TEST FACILITY CABLE ASSIGNMENT DRAWINGS (CAD'S)		
DRAWING NUMBER T1400-003	REVISION E	SHEET 7 OF 18

	1402/1403 TB2		MODULE CONNECTOR	
1412C ACCESS MODULE	7	DP MUTE RELAY - SEE NOTE	24	1434 OR 1435 SIGNAL MODULE
	9	MF/TT OUTPUT TIP	37	
	16	MF/TT OUTPUT RING	43	
	17	MF/TT MUTE RELAY - SEE NOTE	6	
	56	DP RELAY - SEE NOTE	4	

CAD 8

NOTE: NOT CONNECTED IF TEST FACILITY CONTAINS A 1461 OR 1462 SUPERVISION MODULE.

ADC		
1400 TEST FACILITY CABLE ASSIGNMENT DRAWINGS (CAD'S)		
DRAWING NUMBER T1400-003	REVISION E	SHEET 8 OF 18

1412C ACCESS MODULE	1402/1403 TB2		MODULE CONNECTOR	1443C VOM MODULE
	34	LOOP CURRENT SELECT (T)	10	
	36	LOOP CURRENT SELECT (R)	12	
	31	LOOP (T)	2 2	
	29	LOOP (R)	24	

CAD 9

1412C ACCESS MODULE	1402/1403 TB2		MODULE CONNECTOR	1462 SUPERVISION MODULE
	55	2W LINE (T)	23	
	53	2W LINE (R)	25	
	51	2W DROP (T)	24	
	49	2W DROP (R)	26	
	41	4W LINE XMT (T)	35	
	43	4W LINE XMT (R)	37	
	40	4W LINE RCV (T)	39	
	38	4W LINE RCV (R)	41	
	47	4W DROP XMT (T)	36	
	45	4W DROP XMT (R)	38	
	42	4W DROP RCV (T)	40	
	44	4W DROP RCV (R)	42	
	30	2W LINE RELAY	7	
	46	2W DROP RELAY	11	
	28	4W LINE RELAY	5	
	32	4W DROP RELAY	9	
	56	DP RELAY	2	
	7	DP MUTE RELAY	4	
	17	MF/TT MUTE RELAY	6	

CAD 10

ADC

1400 TEST FACILITY
CABLE ASSIGNMENT DRAWINGS (CAD'S)

DRAWING NUMBER	REVISION	SHEET
T1400-003	E	9 OF 18

	MODULE CONNECTOR		MODULE CONNECTOR	
1422 COMMUNICATION MODULE	1	LINE SELECT MONITOR RELAY	13	1462 SUPERVISION MODULE

CAD 11

	4	DP RELAY	1	
1434 OR 1435 SIGNAL MODULE	24	DP MUTE RELAY	3	1462 SUPERVISION MODULE
	6	MF/TT MUTE RELAY	6	

CAD 12

1400 TEST FACILITY
CABLE ASSIGNMENT DRAWINGS (CAD'S)

DRAWING NUMBER	REVISION	SHEET
T1400-003	E	10 OF 18

1462 SUPERVISION MODULE	MODULE CONNECTOR		MODULE CONNECTOR	1462 SUPERVISION MODULE
	27	4W LINE XMT (T)	35	
	29	4W LINE XMT (R)	37	
	31	4W LINE RCV (T)	39	
	33	4W LINE RCV (R)	41	
	28	4W DROP XMT (T)	36	
	30	4W DROP XMT (R)	38	
	32	4W DROP RCV (T)	40	
	34	4W DROP RCV (R)	42	

CAD 13

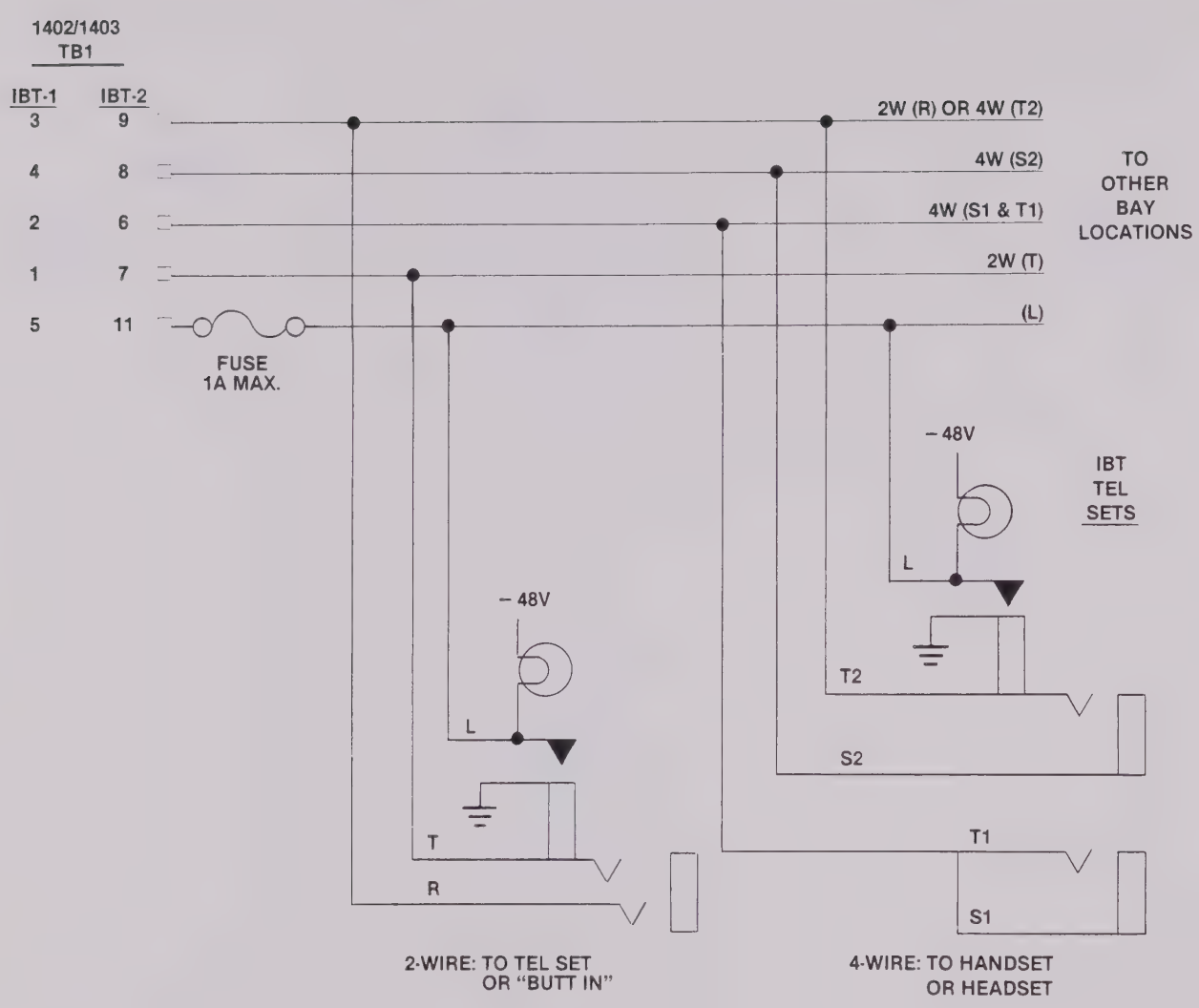
1402/1403 SHELF	TB1		MODULE CONNECTOR	1462 SUPERVISION MODULE
	16	2W LINE (T)	19	
	20	2W DROP (T)	20	
	18	2W LINE (R)	21	
	22	2W DROP (R)	22	
	15	E & M LINE E (T)	15	
	17	E & M LINE M (R)	17	
	19	E & M DROP E (T)	16	
	21	E & M DROP M (R)	18	
	24	SIGNAL TEST (T)	12	
	26	SIGNAL TEST (R)	14	

1400 TEST FACILITY
CABLE ASSIGNMENT DRAWINGS (CAD'S)

DRAWING NUMBER	REVISION	SHEET
T1400-003	E	11 OF 18

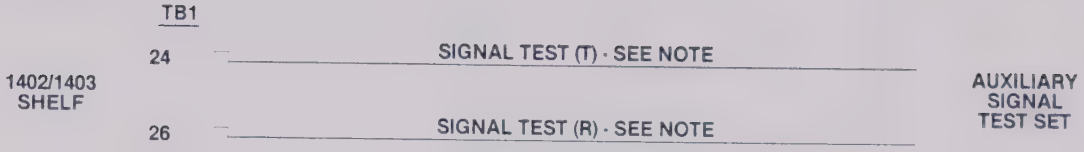
CAD 15

1400 TEST FACILITY CABLE ASSIGNMENT DRAWINGS (CAD'S)		
DRAWING NUMBER T1400-003	REVISION E	SHEET 12 OF 18



CAD 16

ADC		
1400 TEST FACILITY CABLE ASSIGNMENT DRAWINGS (CAD'S)		
DRAWING NUMBER T1400-003	REVISION E	SHEET 13 OF 18



CAD 17

NOTE: CONNECTED TO ACCESSED CIRCUIT THROUGH 1462 SUPERVISION MODULE

1400 TEST FACILITY CABLE ASSIGNMENT DRAWINGS (CAD'S)		
DRAWING NUMBER T1400-003	REVISION E	SHEET 14 OF 18

1402/1403 SHELF	TB1		CORD REEL PANEL AND/OR MISCELLANEOUS JACKFIELD
	15	E & M SIGNAL LINE E (T)	
	17	E & M SIGNAL LINE M (R)	
	19	E & M SIGNAL DROP E (T)	
	21	E & M SIGNAL DROP M (R)	
	16	2W LINE (T) · SEE NOTE	
	18	2W LINE (R)—SEE NOTE	
	20	2W DROP (T) · SEE NOTE	
	22	2W DROP (R)—SEE NOTE	

NOTE: CONNECTED ONLY IF TEST FACILITY CONTAINS A 1462 SUPERVISION MODULE.

CAD 18

1412C ACCESS MODULE	1402/1403 TB2		CORD REEL PANEL AND/OR MISCELLANEOUS JACKFIELD
	38	4W LINE RCV (R)	
	40	4W LINE RCV (T)	
	42	4W DROP RCV (T)	
	44	4W DROP RCV (R)	
	41	4W LINE XMT (T)	
	43	4W LINE XMT (R)	
	45	4W DROP XMT (R)	
	47	4W DROP XMT (T)	
	49	2W DROP (R)—SEE NOTE	
	51	2W DROP (T)—SEE NOTE	
	53	2W LINE (R)—SEE NOTE	
	55	2W LINE (T)—SEE NOTE	

CAD 19

NOTE: NOT CONNECTED IF TEST FACILITY CONTAINS A 1462 SUPERVISION MODULE.

ADC

1400 TEST FACILITY
CABLE ASSIGNMENT DRAWINGS (CAD'S)

DRAWING NUMBER	REVISION	SHEET
T1400-003	E	15 OF 18

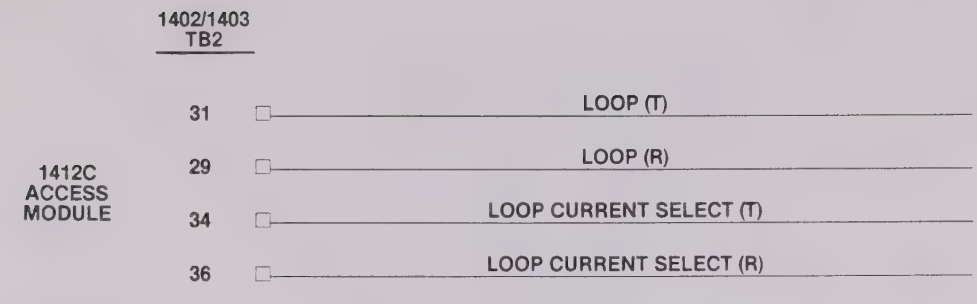
1412C ACCESS MODULE	1402/1403 TB2		AUXILIARY TRANSMISSION TEST SET
	2	TTS OSCILLATOR CONTROL (COM)	
	4	TTS OSCILLATOR CONTROL (N.O.)	
	6	TTS OSCILLATOR CONTROL (N.C.)	
	21	TTS OSCILLATOR (T)—SEE NOTE	
	23	TTS OSCILLATOR (R)—SEE NOTE	
	24	TTS MEASURE CONTROL (COM)	
	22	TTS MEASURE CONTROL (N.O.)	
	26	TTS MEASURE CONTROL (N.C.)	
	27	TTS MEASURE (T)—SEE NOTE	
	25	TTS MEASURE (R)—SEE NOTE	

CAD 20

NOTE: IF THE AUXILIARY TRANSMISSION TEST SET IS PORTABLE, THESE CONNECTIONS MAY BE MADE VIA A MISCELLANEOUS JACKFIELD.

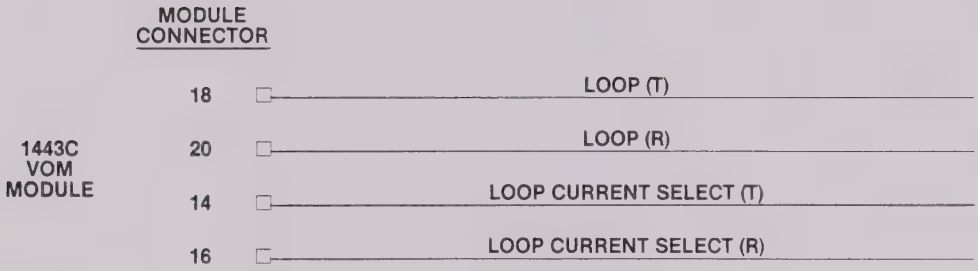
1400 TEST FACILITY
CABLE ASSIGNMENT DRAWINGS (CAD'S)

DRAWING NUMBER	REVISION	SHEET
T1400-003	E	16 OF 18



NOTE: THIS CAD IS APPLICABLE ONLY IF THE TEST FACILITY DOES NOT HAVE A 1443C VOM MODULE. IF THE AUXILIARY VOM IS PORTABLE, THESE CONNECTIONS MAY BE MADE VIA A MISCELLANEOUS JACKFIELD.

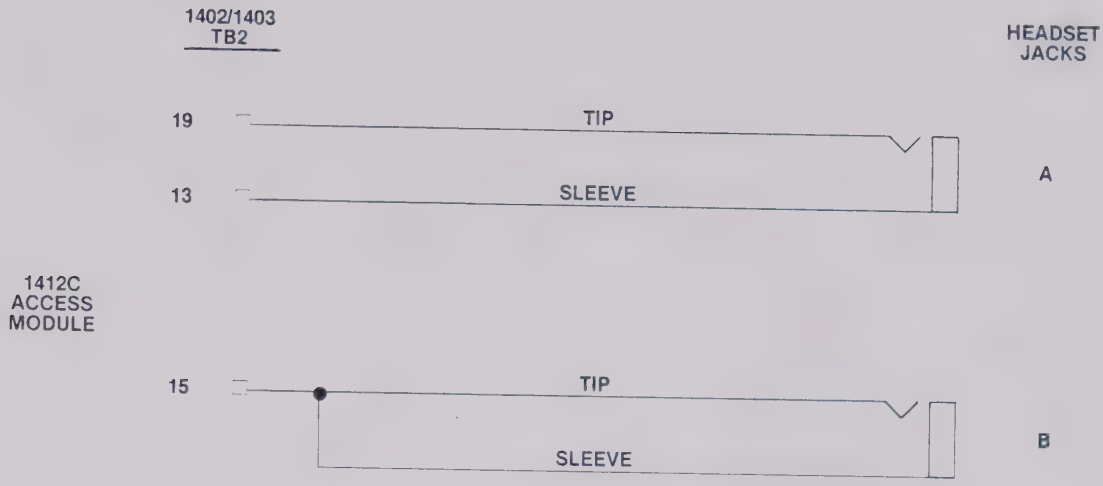
CAD 21a



NOTE: THIS CAD IS APPLICABLE ONLY IF THE TEST FACILITY HAS A 1443C VOM MODULE. IF THE AUXILIARY VOM IS PORTABLE, THESE CONNECTIONS MAY BE MADE VIA A MISCELLANEOUS JACKFIELD.

CAD 21b

1400 TEST FACILITY CABLE ASSIGNMENT DRAWINGS (CAD'S)		
DRAWING NUMBER T1400-003	REVISION E	SHEET 17 OF 18



CAD 22

1400 TEST FACILITY CABLE ASSIGNMENT DRAWINGS (CAD'S)		
DRAWING NUMBER T1400-003	REVISION E	SHEET 18 OF 18

1	NEG BATT OUT	AUX TTS CONT. (COM)	2
3	NEG BATT IN	AUX TTS OSC CONT. (N.O.)	4
5	L.S. MON. REL	AUX TTS OSC CONT. (N.C.)	6
7	DP MUTE REL	– 24 Vdc	8
9	MF/TT INPUT	REV BATT SUP	10
11	CHASSIS GND	– 24 Vdc	12
13	EXT HEADSET (S)	GROUND	14
15	EXT HEADSET (T & S)	12V. COM.	16
17	MF/TT MUTE RELAY		18
19	EXT HEADSET (T)	OFF. BATT. (–)	20
21	AUX TTS OSC (T)	AUX TTS MEAS CONT. (N.O.)	22
23	AUX TTS OSC (T)	AUX TTS MEAS CONT. (COM)	24
25	AUX TTS (R)	AUX TTS MEAS CONT. (N.C.)	26
27	AUX TTS (T)	4W LINE RELAY	28
29	LOOP (R)	2W LINE RELAY	30
31	LOOP (T)	4W DROP RELAY	32
33	AUX VOM (T)	LOOP CURRENT SELECT (T)	34
35	AUX VOM (R)	LOOP CURRENT SELECT (R)	36
37	20 Hz RING GEN (R)	4W LINE RCV (R)	38
39	RING GEN GND (T)	4W LINE RCV (T)	40
41	4W LINE XMT (T)	4W DROP RCV (T)	42
43	4W LINE XMT (R)	4W DROP RCV (R)	44
45	4W DROP XMT (R)	2W DROP RELAY	46
47	4W DROP XMT (T)	GROUND	48
49	2W DROP (R)	TEL BUS (R)	50
51	2W DROP (T)	TEL BUS (T)	52
53	2W LINE (R)	TALK RELAY	54
55	2W LINE (T)	DP CONTACTS	56

1402/1403 TB2 AND 1412C MODULE CONNECTOR

1	IBT-1 2W (T)	IBT-1 4W (S1 & T1)	2
3	IBT-1 2W (R) OR 4W (T2)	IBT-1 4W (S2)	4
5	IBT-1 (L)	IBT-2 4W (S1 & T1)	6
7	IBT-2 2W (T)	IBT-2 4W (S2)	8
9	IBT-2 2W (R) OR 4W (T2)		10
11	IBT-2 (L)		12
13			14
15	E & M LINE E (T)	2W LINE (T)	16
17	E & M LINE M (R)	2W LINE (R)	18
19	E & M DROP E (T)	2W DROP (T)	20
21	E & M DROP M (R)	2W DROP (R)	22
23	EXT. BELL (COM)	SIG TEST (T)	24
25	EXT. BELL (REL. CONT.)	SIG TEST (R)	26
27			28
29	TEST BAT	TEST BAT GND	30

1402/1403 TB1

1400 TEST FACILITY
TERMINAL BLOCK/CONNECTOR DRAWINGS

DRAWING NUMBER	REVISION	SHEET
T1400-004	D	1 OF 5

1	LINE 1 (R)	LINE 1 (A1)	2
3	LINE 1 (L)	LINE 2 (R)	4
5		LINE 2 (L)	6
7	LINE 3 (R)		8
9	LINE 3 (L)	LINE 4 (R)	10
11		LINE 4 (L)	12
13	LINE 5 (R)		14
15	LINE 5 (L)		16
17			18
19			20
21			22
23			24
25	KEYSET COMMON AUDIBLE	LINE 1 (T)	26
27	LINE 1 (A)	LINE 1 (LG)	28
29	LINE 2 (T)	LINE 2 (A)	30
31	LINE 2 (LG)	LINE 3 (T)	32
33	LINE 3 (A)	LINE 3 (LG)	34
35	LINE 4 (T)	LINE 4 (A)	36
37	LINE 4 (LG)	LINE 5 (T)	38
39	LINE 5 (A)	LINE 5 (LG)	40
41			42
43			44
45			46
47			48
49		KEYSET COMMON AUDIBLE RETURN	50

1422
CONNECTOR P1

1	LS MON RELAY		2
3	EXT. BELL (COMMON)	EXT. BELL (RELAY CONT.)	4
5	IBT-1 (L) EXTENDED		6
7	IBT-2 (L) EXTENDED	COMM. AUD. SIG. EXTENDED	8
9		TIP TEST SIG. IN	10
11			12
13	IBT-1/3 (L)		14
15	IBT-2/4 (L)		16
17	IBT-2/4 2W (T)		18
19	IBT-2 2W (R) EXTENDED		20
21	IBT-2/4 4W (S1 & T1)		22
23	IBT-1/3 2W (T)	IBT-1/3 4W (T2) & 2W (R)	24
25	IBT-2/4 4W (T2) & 2W (R)	IBT-1 (R) EXTENDED	26
27	IBT-2/4 4W (S2)	IBT-1/3 4W (S1 & T1)	28
29	IBT-2 (T) EXTENDED	IBT-1/3 4W (S2)	30
31	TEL BUS (T)	IBT-1 (T) EXTENDED	32
33	TEL BUS (R)		34
35			36
37		OFF BATT (SW)	38
39	-12 Vdc		40
41			42
43	12 Vdc COM.		44
45			46
47	+ 12 Vdc		48
49		CHAS. GND.	50

1422 MODULE CONNECTOR

1400 TEST FACILITY TERMINAL BLOCK/CONNECTOR DRAWINGS		
DRAWING NUMBER T1400-004	REVISION D	SHEET 2 OF 5

1		REMOTE STOP DIAL	2
3		DIAL PULSE RELAY	4
5	TEST POINT (-7 Vdc)	MF/TT MUTE RELAY	6
7	TEST POINT (-12 Vdc)		8
9	TEST POINT (BATT)		10
11	TEST POINT (-12 Vdc)		12
13			14
15	TEST POINT (-24 Vdc)		16
17			18
19			20
21			22
23		DP MUTE RELAY	24
25			26
27			28
29			30
31			32
33			34
35			36
37	MF/TT OUTPUT TIP		38
39			40
41			42
43	MF/TT OUTPUT RING		44
45		– 48 Vdc	46
47	OFFICE COMMON (GND)		48
49		CHAS GND.	50

1434 MODULE CONNECTOR

1400 TEST FACILITY TERMINAL BLOCK/CONNECTOR DRAWINGS		
DRAWING NUMBER **T1400-004**	**REVISION** **D**	**SHEET** **3 OF 5**

1		REMOTE STOP DIAL	2
3		DIAL PULSE RELAY	4
5	TEST POINT (-7 Vdc)	MF/TT MUTE RELAY	6
7	TEST POINT (-12 Vdc)		8
9	TEST POINT (BATT)		10
11	TEST POINT (-12 Vdc)		12
13			14
15	TEST POINT (-24 Vdc)		16
17			18
19			20
21			22
23		DP MUTE RELAY	24
25			26
27			28
29			30
31			32
33			34
35			36
37	MF/TT OUTPUT TIP		38
39			40
41			42
43	MF/TT OUTPUT RING		44
45		– 48 Vdc	46
47	OFFICE COMMON (GND)		48
49		CHAS GND.	50

1435 MODULE CONNECTOR

1	TEST BAT (BRKDN)		2
3			4
5	TEST BATT GND		6
7			8
9		LOOP CURRENT SELECT (T)	10
11		LOOP CURRENT SELECT (R)	12
13		AUX VOM (TC)	14
15		AUX VOM (RC)	16
17		AUX VOM (T)	18
19		AUX VOM (R)	20
21		LOOP (T)	22
23		LOOP (R)	24
25			26
27			28
29			30
31			32
33			34
35			36
37			38
39			40
41		– 24 Vdc	42
43	CURRENT MODE SELECT		44
45		C.O. GROUND	46
47			48
49		CHASSIS GROUND	50

1443C MODULE CONNECTOR

1400 TEST FACILITY
TERMINAL BLOCK/CONNECTOR DRAWINGS

DRAWING NUMBER	REVISION	SHEET
T1400-004	D	4 OF 5

1	DP RELAY IN	DP RELAY OUT	2
3	DP MUTE RELAY IN	DP MUTE RELAY OUT	4
5	4W LINE RELAY	MF/TT MUTE RELAY OUT	6
7	2W LINE RELAY	4WSX/E & M CONT. OUT	8
9	4W DROP RELAY	RINGING SIGNAL IN/OUT	10
11	2W DROP RELAY	SIGNAL TEST (T)	12
13	LINE SEL MON REL	SIGNAL TEST (R)	14
15	E & M LINE E (T)	E & M DROP E (T)	16
17	E & M LINE M (R)	E & M DROP M (R)	18
19	2W LINE (T) IN	2W DROP (T) IN	20
21	2W LINE (R) IN	2W DROP (R) IN	22
23	2W LINE (T) OUT	2W DROP (T) OUT	24
25	2W LINE (R) OUT	2W DROP (R) OUT	26
27	4WSX LINE XMT (T)	4WSX DROP XMT (T)	28
29	4WSX LINE XMT (R)	4WSX DROP XMT (R)	30
31	4WSX LINE RCV (T)	4WSX DROP RCV (T)	32
33	4WSX LINE RCV (R)	4WSX DROP RCV (R)	34
35	4WSF LINE XMT (T)	4WSF DROP XMT (T)	36
37	4WSF LINE XMT (R)	4WSF DROP XMT (R)	38
39	4WSF LINE RCV (T)	4WSF DROP RCV (T)	40
41	4WSF LINE RCV (R)	4WSF DROP RCV (R)	42
43			44
45		– 48 Vdc	46
47			48
49	EXT E & M VOLTS	GROUND	50

1462 MODULE CONNECTOR

ADC		
1400 TEST FACILITY TERMINAL BLOCK/CONNECTOR DRAWINGS		
DRAWING NUMBER T1400-004	REVISION D	SHEET 5 OF 5

DRAWING INDEX

CONTENTS	NUMBER SD1400-	NUMBER OF DRAWINGS	REVISION	PAGE
SD DRAWING INDEX	000	1	H	5-1
1402 TEST FACILITY SHELF	001	1	B	5-2
1403 TEST FACILITY SHELF	002	1	B	5-3
1412C ACCESS MODULE	003	2	E	5-4
1422 COMMUNICATION MODULE	004	6	C	5-6
1434/1435 SIGNAL MODULE	005	1	D	5-12
1443C VOM MODULE	006	2	C	5-13
1462 SUPERVISION MODULE	007	5	B	5-15

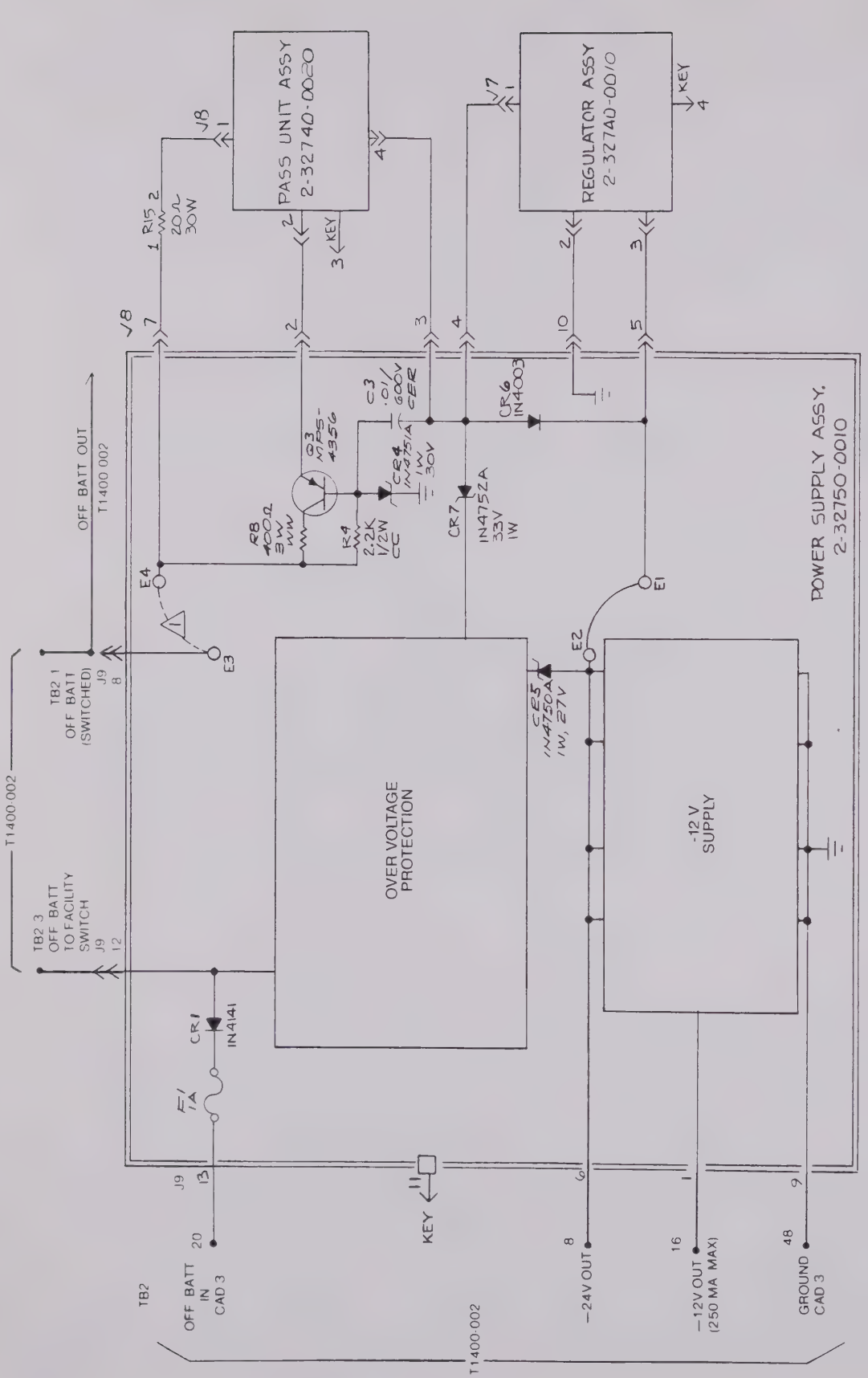
REVISION HISTORY

REVISION	ECO	DATE	REASON FOR CHANGE
A		7/77	INITIAL RELEASE
B		11/79	ELIMINATED FOLDOUTS
C		4/81	CHANGED DVOM SHUNT RESISTORS TO 1.00 OHM PER ECO
D		11/82	ADDED 1460 MODULE AND ADDED 1461 AND 1462 MODULES
E		12/83	REPLACED 1412C, 1422, 1432, 1433, 1443C MODULE FIGURES TO DEPICT NEW FRONT PANEL LAYOUTS
F		5/84	REVISED SCHEMATICS 1412C, 1432, AND 1433 MODULES REDESIGN CHANGES
G		11/84	DELETED 1461 MODULE
H		3/86	DELETED 1432 AND 1433 SIGNAL MODULES AND ADDED 1434 AND 1435 SIGNAL MODULES

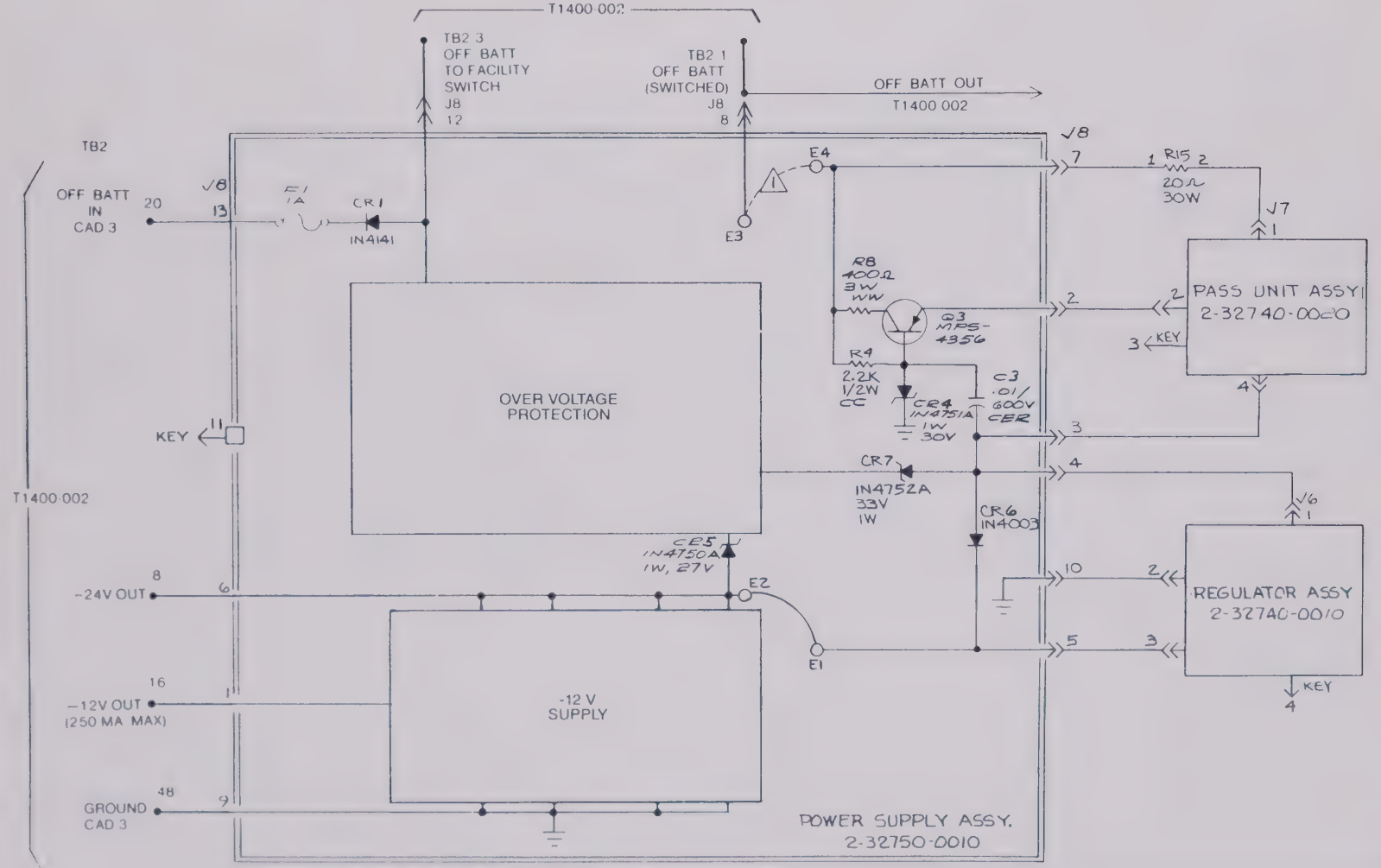
NOTES:

1. THE DRAWING INDEX REVISION LEVEL REFLECTS THE LATEST REVISION TO THE ENTIRE DRAWING SET AND WILL BE CHANGED EACH TIME ONE OR MORE DRAWINGS IS REVISED.
2. ONLY DRAWINGS AFFECTED BY A CHANGE WILL BE REVISED; THE REVISION LEVEL OF EACH DRAWING REFLECTS THE LATEST APPLICABLE CHANGE TO THAT DRAWING

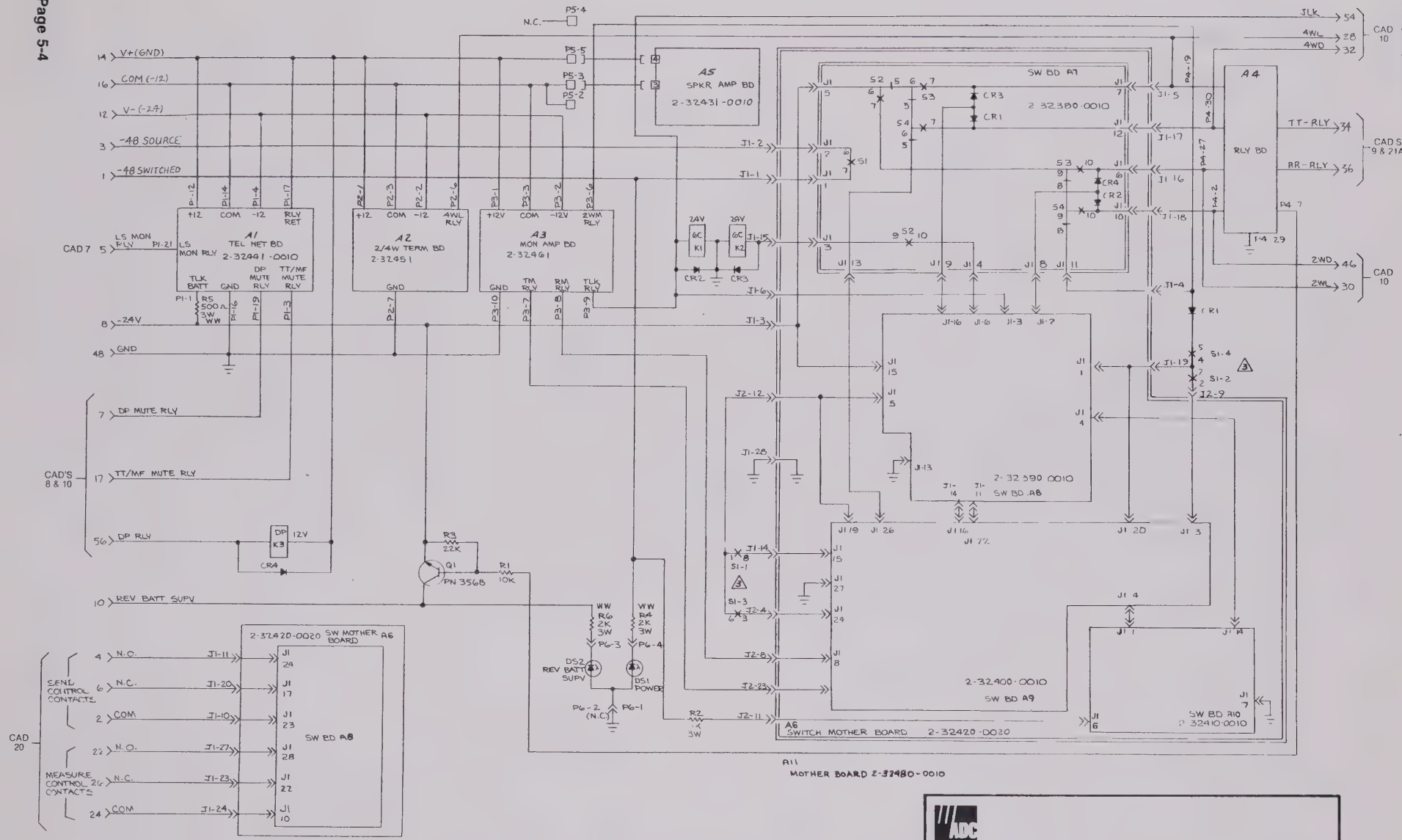
1400 TEST FACILITY SD DRAWING INDEX		
DRAWING NUMBER SD1400-000	REVISION H	SHEET 1 OF 1



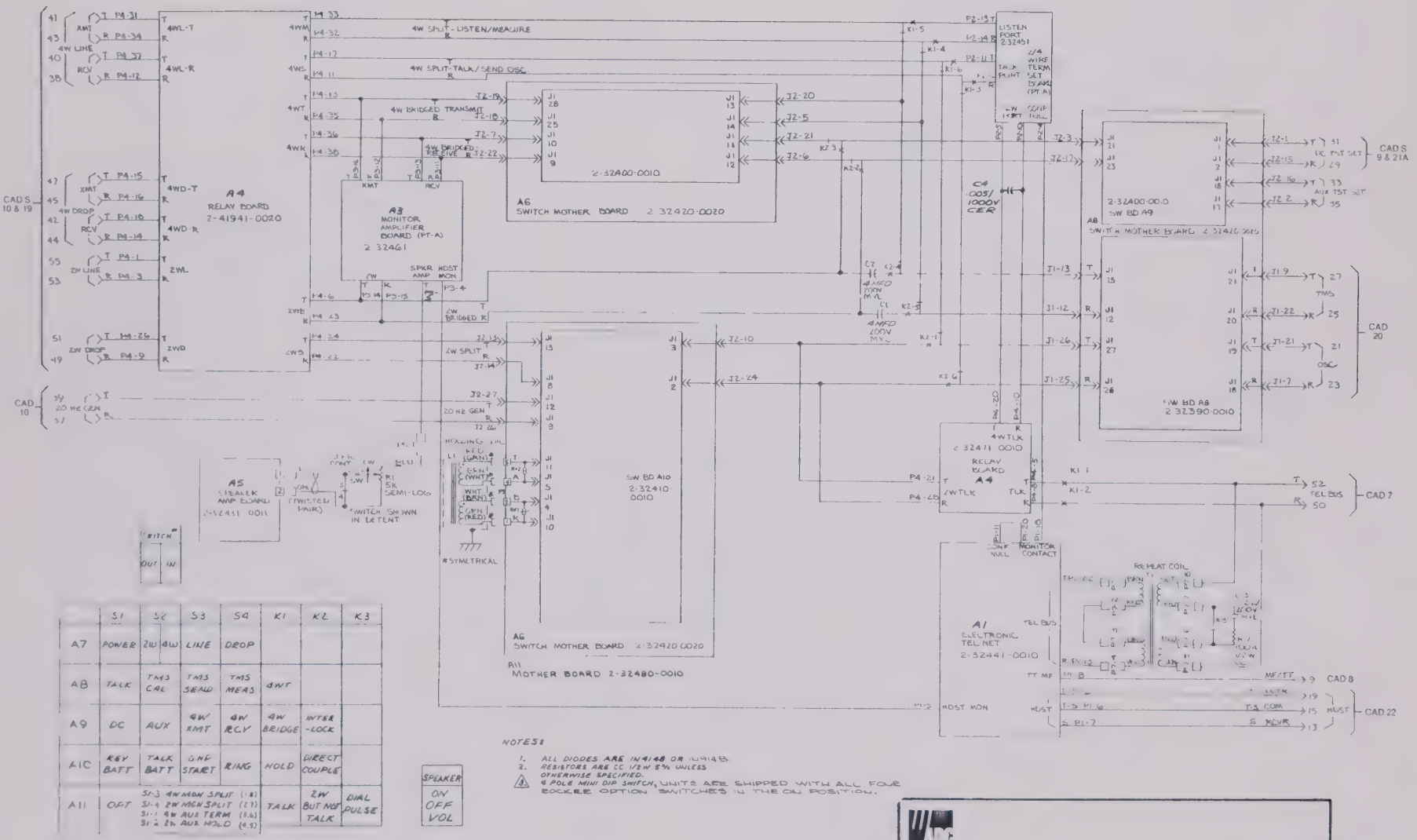
1400 TEST FACILITY SCHEMATIC, 1402 TEST FACILITY SHELF		
DRAWING NUMBER	REVISION	SHEET
SD1400-001	B	1 OF 1



1400 TEST FACILITY SCHEMATIC, 1403 TEST FACILITY SHELF		
DRAWING NUMBER	REVISION	SHEET
SD1400-002	B	1 OF 1



1400 TEST FACILITY SCHEMATIC, 1412C ACCESS MODULE		
DRAWING NUMBER SD1400-003	REVISION E	SHEET 1 OF 2

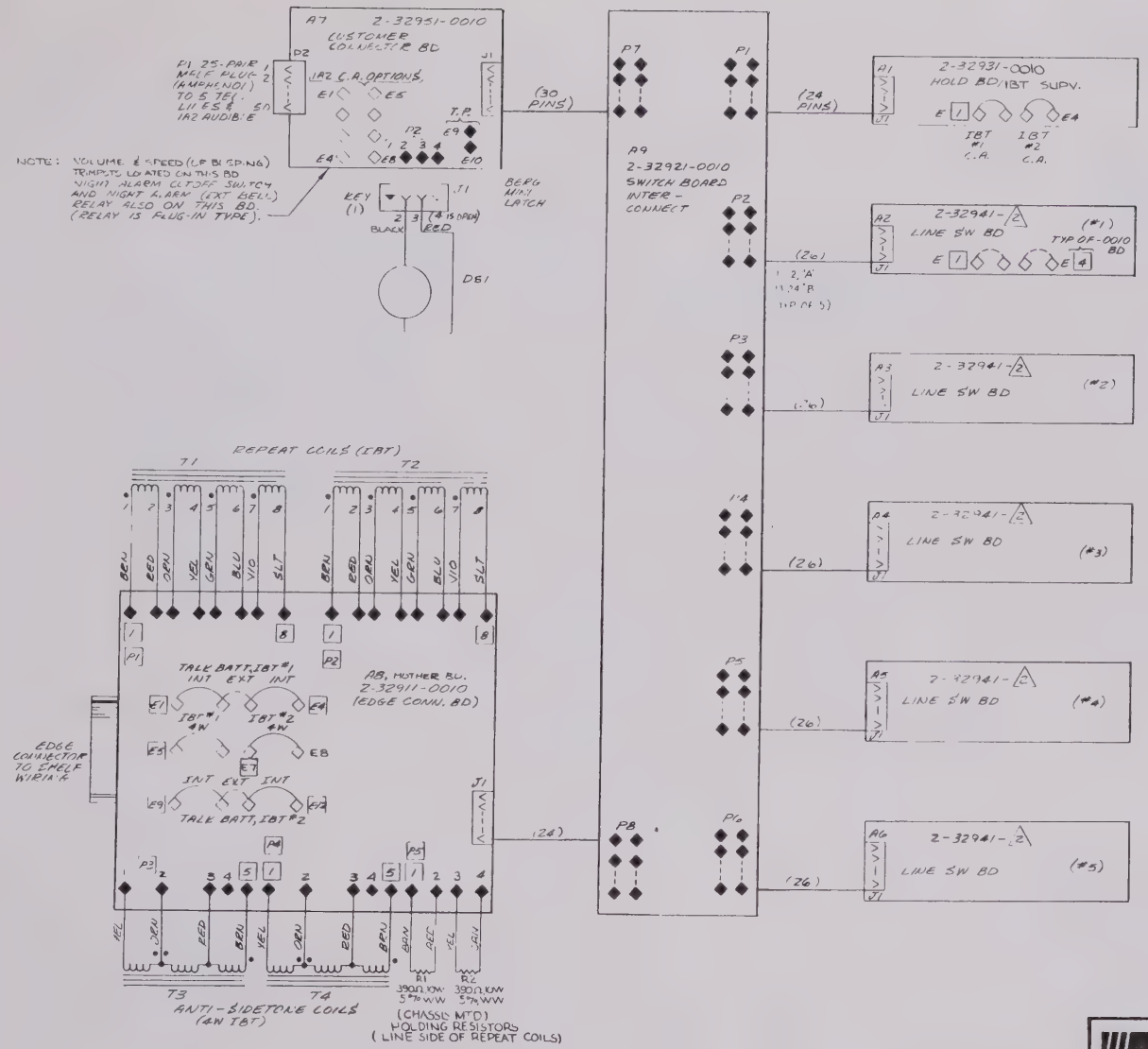


	S1	S2	S3	S4	K1	K2	K3
A7	POWER	2W	4W	LINE	DROP		
A8	TALK	TMS CAL	TMS SEND	TMS MEAS	4WT		
A9	DC	AUX	4W XMT	4W RCV	4W BRIDGE	INTER -LOCK	
A10	REV BATT	TALK BATT	GND START	RING	HOLD	DIRECT COUPLE	
A11	OCT	S1-3 4W MON SPLIT (1.8) S1-4 2W MON SPLIT (2.7) S1-1 4W AUX TERM (8.6) S1-2 2W AUX HOLD (4.3)			TALK	2W BUT NOT TALK	DIAL PULSE

SPEAKER
ON
OFF
VOL

NOTES:
1. ALL DIODES ARE IN4148 OR IN914B
2. RESISTORS ARE CC 1/2W 5% UNLESS OTHERWISE SPECIFIED.
3. 6 POLE MINI DIP SWITCH, UNITS ARE SHIPPED WITH ALL FOUR ROCKER OPTION SWITCHES IN THE ON POSITION.

1400 TEST FACILITY SCHEMATIC, 1412C TEST ACCESS MODULE		
DRAWING NUMBER	REVISION	SHEET
SD1400-003	E	2 OF 2



NOTES:

1. SH. 1 SHOWS PRIMARY MODULE (FOR UNES 1-5), 2-32800-1000
   SEE SH 2 FOR 2-32800-2000 SECONDARY MODULE.
   SHT. 3 SHOWS PRIMARY MODULE (W/ 5 IBT TRANSFORMERS) 2-32800-3000.
2. LINE SW BD (BEEP)

   2-32941-0010 = PROGRAMMABLE POTS/IA2
   -0020 = IA2 KEYSET ONLY
   -0030 = 101 TYPE
   THESE ARE INSTALLED DURING SHELF ASSY
3. CUSTOMER INSTALLATION OPTIONS --- SEE SH. 4
4. XX = FOIL DESIGNATIONS

   .045 W/N POSTS = .025 POST

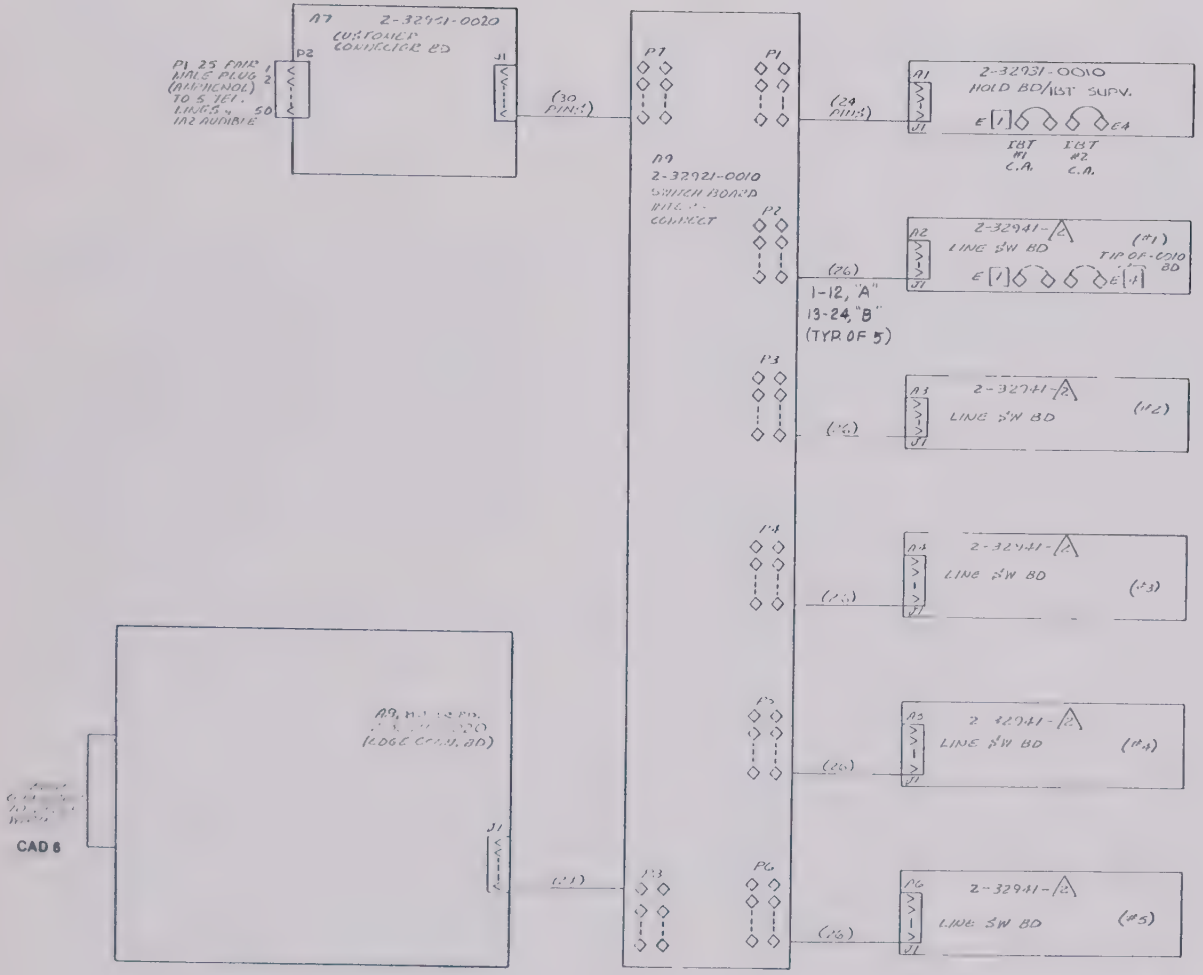
   PV HEADER TO BERG POSTS (DOUBLE ROW)
5. SWITCH DESIGNATIONS --SEE SH. 4
6. ALL P/N ARE SCHEMATIC NOS.

NOTES CONTINUED ON SH. 4

ADC

1400 TEST FACILITY SCHEMATIC, 1422 COMMUNICATION MODULE

DRAWING NUMBER	REVISION	SHEET
SD1400-004	C	1 OF 6



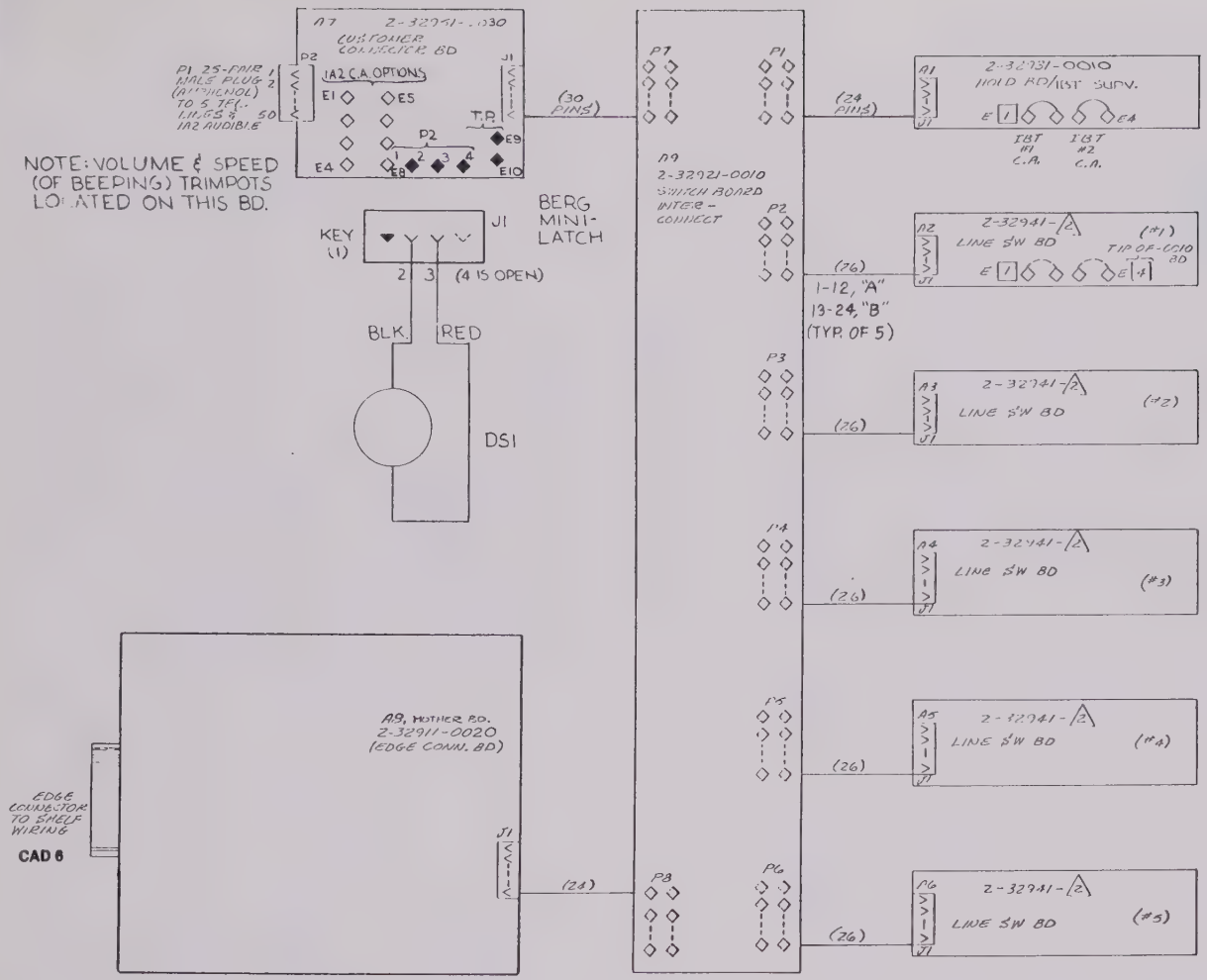
NOTES:

1. SH. 1 SHOWS PRIMARY MODULE (FRAMES 1-5), 2-32800-1000
   THIS SHEET SHOWS 2-32900-2000 SECONDARY MODULE, SHT 3
   A LINE SW BD. (REF) SHOWS PRIMARY MODULE (W/O IBT TRANSFORMERS) 2-32800-3000
   2-32941-0010 = PROGRAMMABLE POTS/IA2
   -0020 = IA2 KEYSET ONLY
   -0030 = 101 TYPE
   THESE ARE INSTALLED DURING SHELF ASSY.

5. SWITCH DESIGNATIONS -- SEE SH. 4
6. ALL P/N ARE SCHEMATIC NOS.

NOTES CONTINUED ON SH. 4

1400 TEST FACILITY SCHEMATIC, 1422 COMMUNICATION MODULE		
DRAWING NUMBER SD1400-004	REVISION C	SHEET 2 OF 6



NOTES:

1. SH. 1 SHOWS PRIMARY MODULE (COLUMNS 1-5), 2-32800-1000
   THIS SHEET SHOWS 2-32900-3000 2W IBT PRIMARY MODULE (MASTER W/O MAGNETICS)
2. /2 LINE SW BD. (REF)

2-32741-0010 = PROGRAMMABLE POTS/1A2
-0020 = 1A2 KEYSET ONLY
-0030 = 101 TRUNK
THESE ARE INSTALLED DURING SHELF ASSY.

5. SWITCH DESIGNATIONS -- SEE SH. 4
6. ALL P/N ARE SCHEMATIC NOS.

NOTES CONTINUED ON SH. 4

1400 TEST FACILITY SCHEMATIC, 1422 COMMUNICATION MODULE		
DRAWING NUMBER	REVISION	SHEET
SD1400-004	C	3 OF 6

NOTES (CONTINUED):

7 - EXPLANATION OF TAB NOS.:

THE 1422 MODULE P/N IS 2-32800- 1000
- 2000
- 3000

7.1
2-32800-1000 = PRIMARY MODULE (TELEPHONE LINES 1-5) ("MASTER")
2000 = SECONDARY MODULE (TELEPHONE LINES 6-10, 11-15, ETC) ("SLAVE")
SECONDARY MODULES ARE NEVER USED ALONE; THEY ARE ALWAYS DEPENDENT UPON A PRIMARY MODULE WITHIN THE SAME 1400 TEST FACILITY.
SECONDARY MODULES (GUTLESS WONDERS) HAVE NO TRANSFORMERS, CHASSIS-MOUNTED RESISTORS, AUDIOLARM, OR EXT BELL RELAY. THE CUSTOMER CONNECTOR BOARD (2-32950-0020) HAS ONLY THE TWO CONNECTORS, AND THE MOTHER BOARD (2-32910-0020) HAS NO WIREWOUNDS, CAPACITORS, OR W/W POSTS.
-3000 MODULES (-2000 MOD'S WITH AUDIOALARM | ASSOC'D ELECTRONICS)

7.2 LINE E D'S A2-A6 ARE ADDED TO THE MODULE DURING TEST SHELF ASSY. THEY MAY BE ANY COMBINATION OF 2-32940-TAB AS ORDERED BY CUSTOMER AND CALLED OUT ON THE SHELF B/M.

8 - SWITCH DESIGNATIONS

PC ASSEMBLY	S1	S2	S3
A1 (HOLD/IBT) A2 (LINE 1)	HOLD LINE 1, TEL	IBT 1 LINE 1, CONF 1	IBT 2 LINE 1, CONF 2
A3 (LINE 2) A4 (LINE 3)	LINE 2, TEL LINE 3, TEL	LINE 2, CONF 1 LINE 3, CONF 1	LINE 2, CONF 2 LINE 3, CONF 2
A5 (LINE 4) A6 (LINE 5)	LINE 4, TEL LINE 5, TEL	LINE 4, CONF 1 LINE 5, CONF 1	LINE 4, CONF 2 LINE 5, CONF 2

A1 S1, HOLD IS A 2 POLE, MOMENTARY ACTION. THE OTHER 17 SWITCHES ARE 4 POLE, ALTERNATE ACTION. ALL 18 SCHADOW SWITCHES ARE F-TYPE, BLACK/GREEN SHELL.

9 - INSTALLATION STRAPPING OPTIONS (-1000 MODULE ONLY):

REFER TO 1400/1403 INSTALLATION MANUAL, 2-33217-0010, FOR ADDITIONAL DETAILS. * ARE THE USUAL FACTORY-INSTALLED JUMPERS.

9.1 MOTHER BOARD
IBT 1, STRAP *E1-E2, *E3-E4 } FOR INTERNAL TALK BATT
IBT 2, STRAP *E9-E10, *E11-E12 } FEED TO IBT'S

IBT 1, E1-E4 ALL OPEN } FOR EXTERNAL T.B. FEED
IBT 2, E9-E12 ALL OPEN }

IBT 1, STRAP *E7-E8 } FOR 4W OR 2W & 4W IBT.
IBT 2, STRAP *E5-E6
CUT STRAPS FOR 2W ONLY-IBT.

9.2 HOLD BOARD
IBT 1, STRAP *E1-E2 } FOR COMMON AUDIBLE ON IBT'S
IBT 2, STRAP *E3-E4 } (INCOMING CALLS, FROM THE BAYS)
CUT STRAPS ON SECOND 1422 MODULE WHEN MORE THAN FIVE LINES ARE ON AN IBT (TWO 1422 MODULES IN ONE SHELF)

9.3 LINE BOARDS
2-32940-0010, STRAP *E1-E2 & *E3-E4 FOR POTS PROGRAMMING

-0030, FOLLOW INSTRUCTION ON 2-32941-0030 SCHEMATIC AND INSTALLATION MANUAL.

9.4 CUSTOMER CONNECTOR BOARD 2-32950-0010, -0030 (KEYSET COMMON AUDIBLE)

IF 1A2 C.A. IS:	STRAP
LESS THAN 30 V(PK)	E2-E5
40-60VAC, VDC	E3-E5
MORE THAN 75VAC, VDC, VAC + VDC	E4-E5
P1-50 NOT GROUNDED IN KSU, BUT C.A. APPLIED ACROSS P1-25 AND P1-50	E6-E7 PLUS ONE OF THE ABOVE
P1-50 SWITCHED TO C.O. GND INSIDE KSU	E1-E2
P1-25 SWITCHED TO C.O GND INSIDE KSU	E1-E2 E5-E6
FLOATING CONTACTS ACROSS P1-25 AND P1-50	E1-E2 E5-E7

10 (REF)

THE SIGNAL INPUTS AND OUTPUTS FOR THE 1422 COMMUNICATION MODULE ARE LISTED BELOW AND ARE SHOWN AS VIEWED FROM THE BACK PANEL. * = CONNECTION TO CUSTOMER CIRCUIT.

REFERENCE					REFERENCE
NOTE 2	LS MON RELAY	1	2		
*NOTE 1	EXT BELL COMM	3	4	EXT BELL	NOTE 1 *
NOTE 3	IBT-1 L EXTENDED	5	6		
NOTE 3	IBT-2 L EXTENDED	7	8	COM AUDSIG ENTENDED	NOTE 3
		9	10	TIP TST SIG	NOTE 1
		11	12		
*NOTE 2,4	IBT-1 L	13	14		
*NOTE 2,4	IBT-2 L	15	16		
*NOTE 4,1	IBT-2 2W T	17	18		
NOTE 3	IBT-2 R EXTENDED	19	20		
*NOTE 4,1	IBT-2 4W SI, TIP1	21	22		
*NOTE 4,1	IBT-1 2W T	23	24	IBT-1 2W R, 4W TIP2	NOTE 1,4 *
*NOTE 4,1	IBT-2 4W TIP2 2WR	25	26	IBT-1 R EXTENDED	NOTE 3
*NOTE 4,1	IBT-2 4W SLV2	27	28	IBT-1 4W SLV1, TIP1	NOTE 1,4 *
NOTE 3	IBT-2 T EXTENDED	29	30	IBT-1 4W SLV2	NOTE 1,4 *
NOTE 2	TEL BUS T	31	32	IBT-1 T EXTENDED	NOTE 3
NOTE 2	TEL BUS R	33	34		
		35	36		
		37	38	BATT SWITCH	NOTE 2
NOTE 2	V-	39	40		
		41	42		
NOTE 2	COMM	43	44		
		45	46		
*NOTE 2	V+	47	48		
		49	50	CHASSIS GND	NOTE 2 *

NOTE 1: IF MORE THAN ONE 1422 COMMUNICATION MODULE IS INCLUDED IN THE TEST FACILITY, THIS PIN CONNECTED ON THE PRIMARY 1422 MODULE ONLY.

NOTE 2: THIS PIN CONNECTED ON EACH 1422 COMMUNICATION MODULE WHEN MORE THAN ONE 1422 MODULE IS INCLUDED IN THE TEST FACILITY.

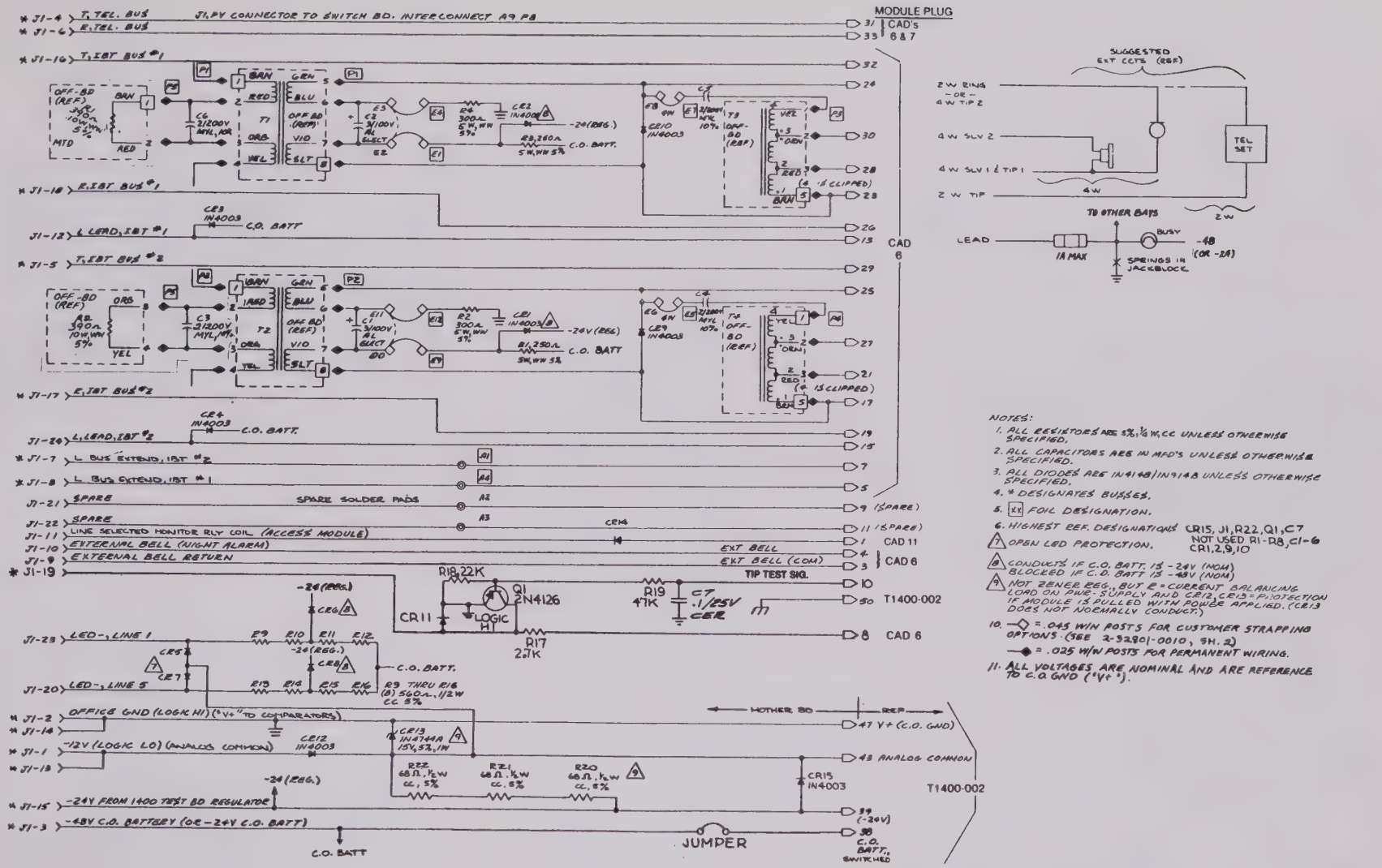
NOTE 3: IF MORE THAN ONE 1422 COMMUNICATION MODULE IS INCLUDED IN THE TEST FACILITY, CONNECT THIS PIN TO THE SAME PIN ON THE OTHER 1422 MODULE(S) IT DOES NOT GO ANYWHERE ELSE.

NOTE 4: WIRE CONNECTIONS LISTED ARE FOR A STANDARD 1400 TEST FACILITY WITH TWO INTERBAY TRUNKS. IF THE FACILITY IS CONNECTED FOR THREE OR FOUR IBT'S, SEE THE SPECIAL ADJUSTMENTS AND STRAPPING OPTIONS IN THE CUSTOMER MANUAL.

ADC

1400 TEST FACILITY SCHEMATIC,
1422 COMMUNICATION MODULE

DRAWING NUMBER	REVISION	SHEET
SD1400-004	C	4 OF 6



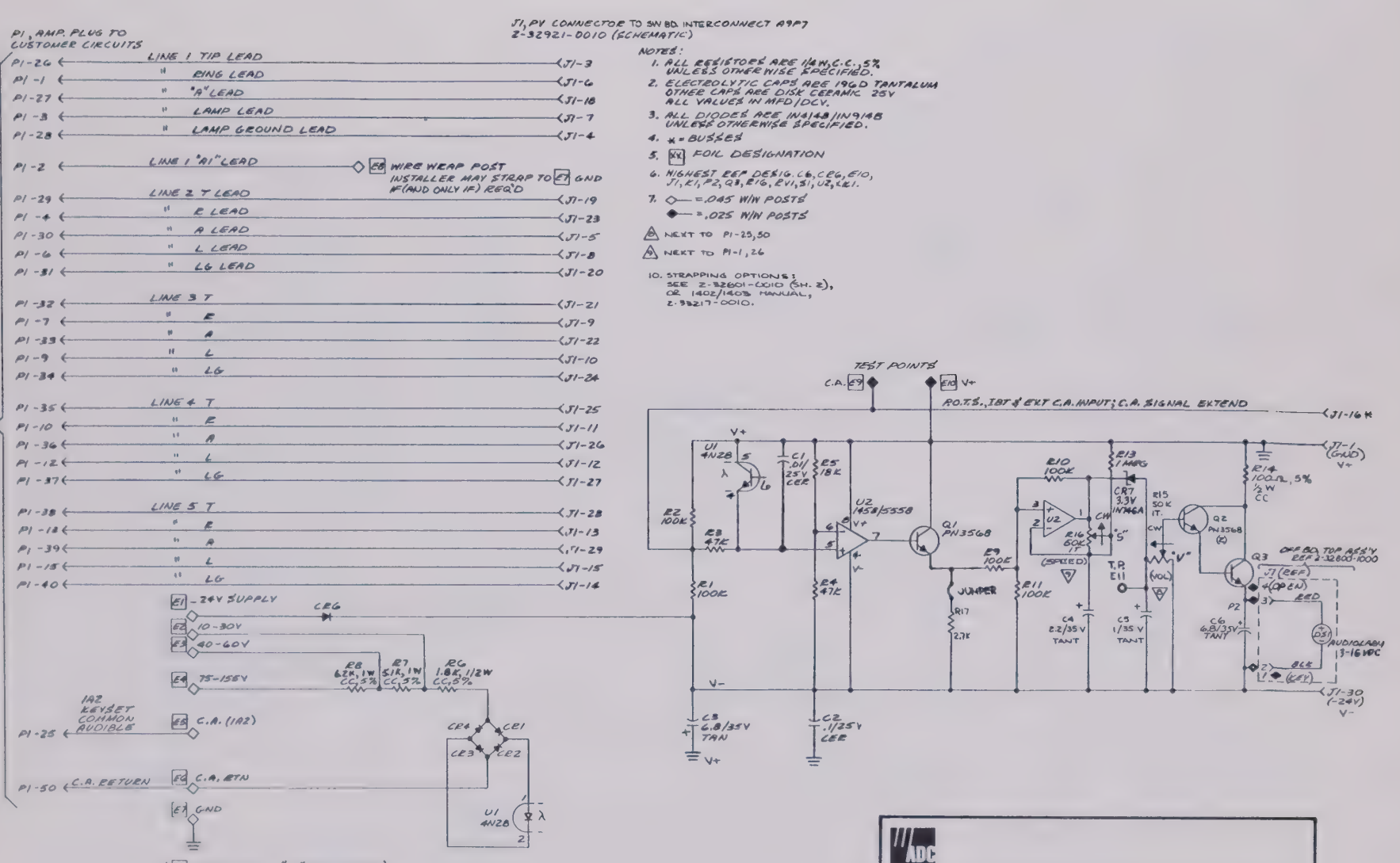
NOTES:

1. ALL RESISTORS ARE 5%, 1/2 W, CC UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MFD'S UNLESS OTHERWISE SPECIFIED.
3. ALL DIODES ARE IN4148/IN914B UNLESS OTHERWISE SPECIFIED.
4. * DESIGNATES BUSSES.
5. XX FOIL DESIGNATION.
6. HIGHEST REF. DESIGNATIONS: CR15, J1, R22, Q1, C7
   NOT USED: R1-R8, C1-6
   CR1, 2, 9, 10
7. OPEN LED PROTECTION.
8. CONDUITS IF C.O. BATT. IS -24V (NOM)
   BLOCKED IF C.O. BATT IS -48V (NOM)
9. NOT ZENER REG., BUT R = CURRENT BALANCING LOAD ON PWR. SUPPLY AND CR13 = PROTECTION IF MODULE IS PULLED WITH POWER APPLIED. (CR13 DOES NOT NORMALLY CONDUCT.)
10. ◇ = .045 W/W POSTS FOR CUSTOMER STRAPPING OPTIONS (SEE 2-32801-0010, SH. 2)
    ● = .025 W/W POSTS FOR PERMANENT WIRING.
11. ALL VOLTAGES ARE NOMINAL AND ARE REFERENCE TO C.O. GND ("V+").

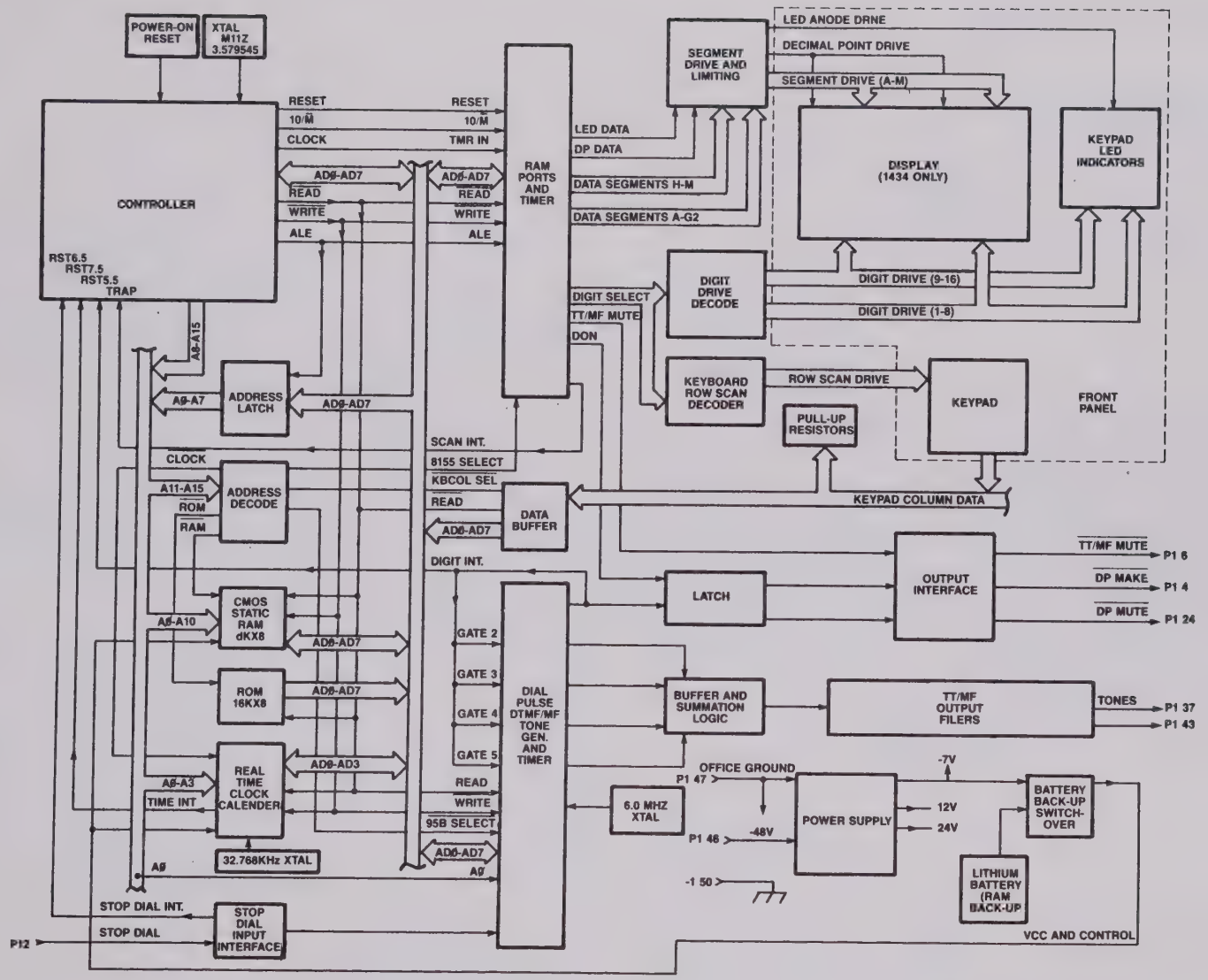
ADC

1400 TEST FACILITY SCHEMATIC, 1422 COMMUNICATION MODULE MOTHERBOARD (A8)

DRAWING NUMBER	REVISION	SHEET
SD1400-004	C	5 OF 6



1400 TEST FACILITY SCHEMATIC, 1422 COMMUNICATION MODULE CUSTOMER CONNECTOR BOARD (A7)		
DRAWING NUMBER	REVISION	SHEET
SD1400-004	C	6 OF 6



1400 TEST FACILITY SCHEMATIC 1434/1435 SIGNAL MODULE		
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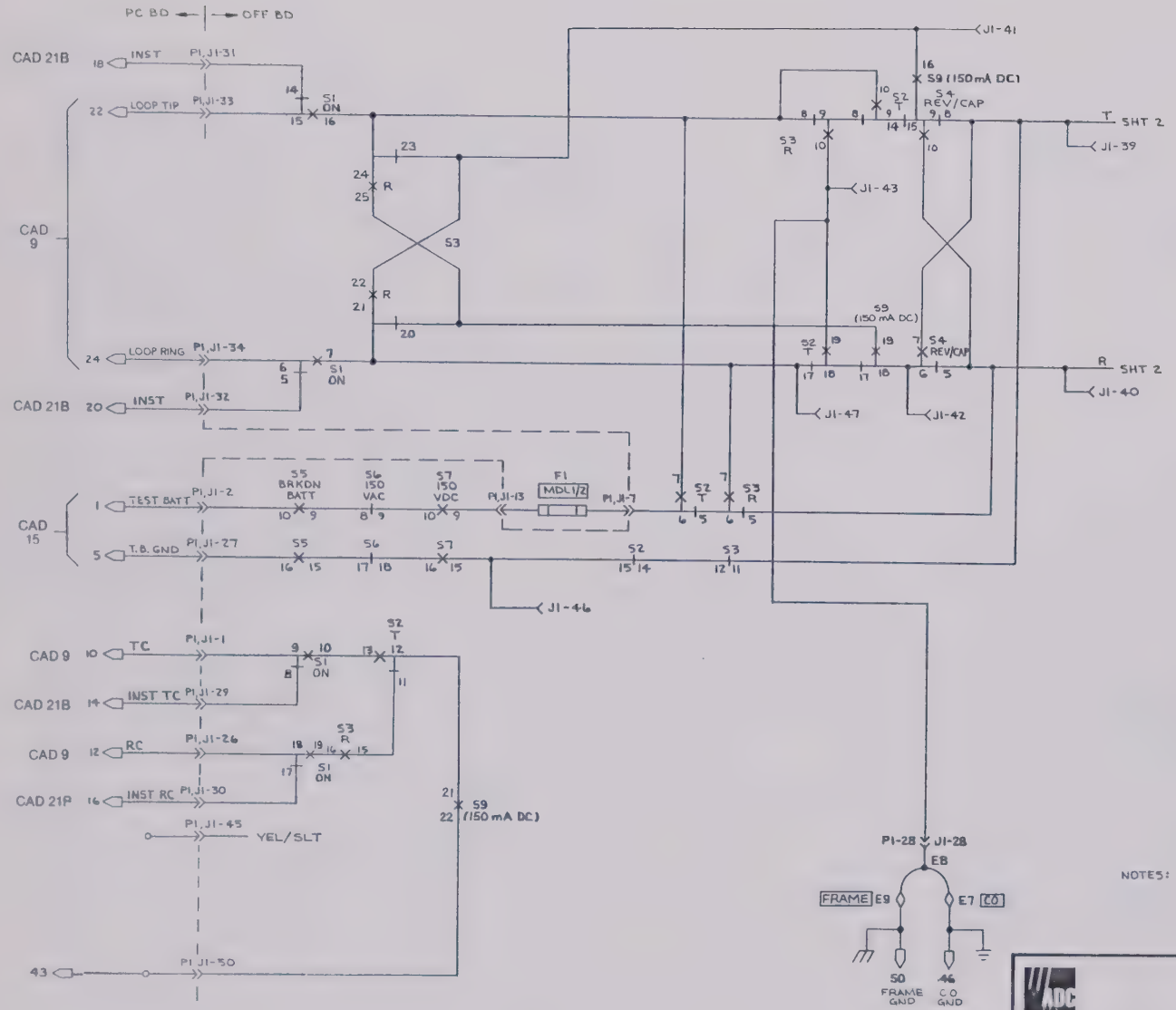


4. UNLESS OTHERWISE SPECIFIED:
   A. ALL RESISTORS ARE 1/4W, CC, 5%.
   B. ALL DIODES ARE IN4148/IN914B.
   C. CAP VALUES, MFD/DCWV.
   D. POLARIZED CAPS ARE 196D TANT.

3.

ROW	SW	NOMEN	TYPE	COLOR
1	S1	(LP) SX	6P P-P	BLK/GRN
1	S2	T	6P P-P	↓
1	S3	R	8P P-P	↓
1	S4	REV/CAP	2P P-P	BLK/GRN
2	S5	BRKDN BATT	4P MOM	GRY/ORG
2	S6	150 VAC	6P PP	BLK/GRN
2	S7	150 VDC	4P	BLK/GRN
2	S8	15 VDC	2P	BLK/GRN
3	S9	150 mADC	4P	BLK/YEL
3	S10	R×10K	4P	↓
3	S11	R×1K	4P	↓
3	S12	R×100	4P PP	BLK/YEL

2. HIGHEST REF DESIGNATION USED:
   CR14, C8, E9, J1, K1, M1, P1, Q2, R35, S12, TP2, T1, U2, F2
1. SYMBOLS:
   XX = FOIL DESIGNATION
   ◇— = WW POST FOR STRAPPING OPTION (.045).
   ◎— = TEST POINT (TURRET TYPE).
   •— = BERG POST (.030) FOR MINI-LATCH HOUSING TO M1.
   ⊲— PC EDGE TAB.

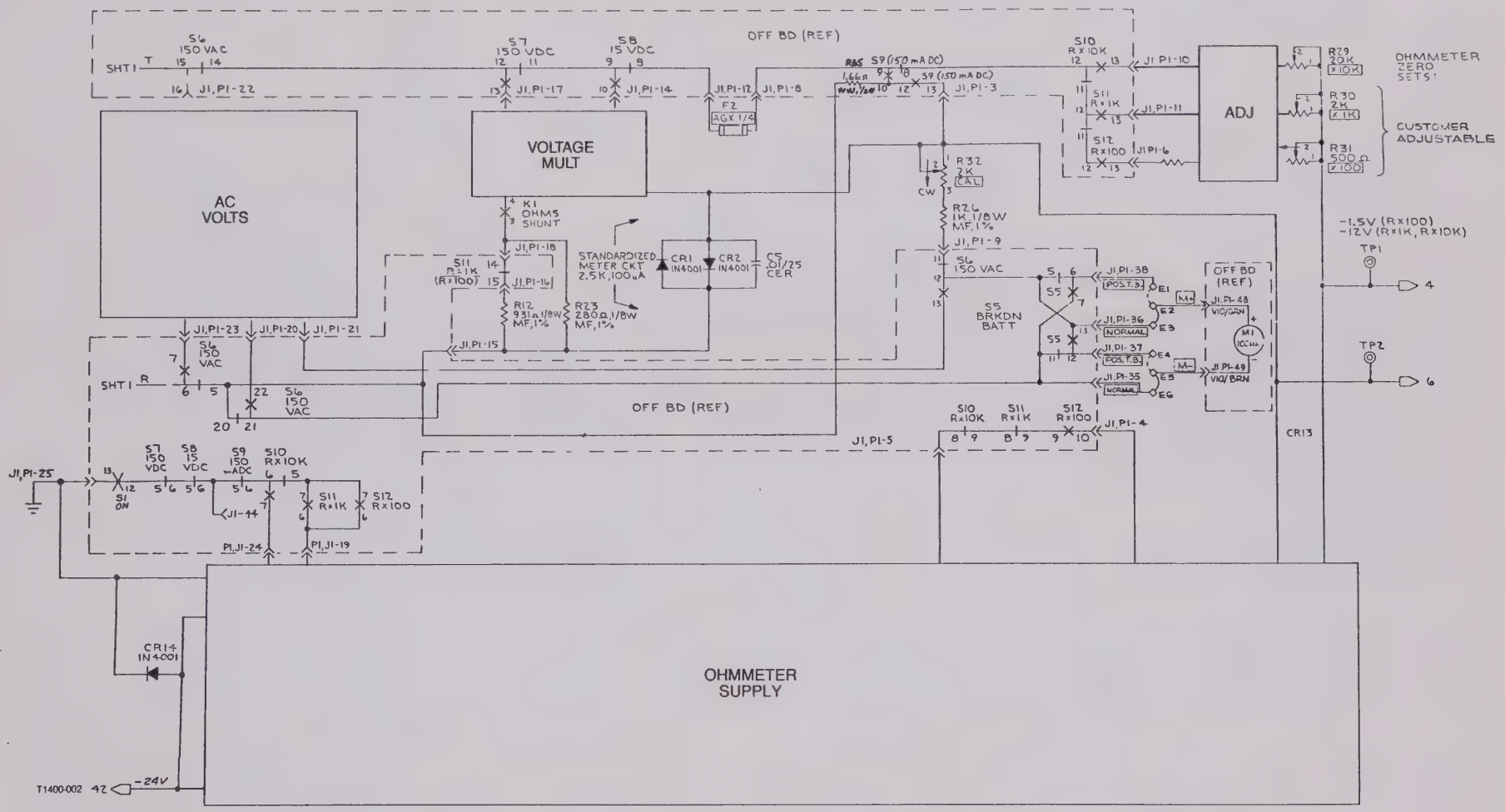
NOTES:

J1, P1 25-PAIR CONNECTORS
J1 CABLE END (RECEPTACLE TO SWITCHES) ——— P1, PC END (PLUG TO PC BD)
NOTE: WHERE J1 IS USED W/O P1, J1 IS A CONTINUITY CHECKER TEST POINT ONLY

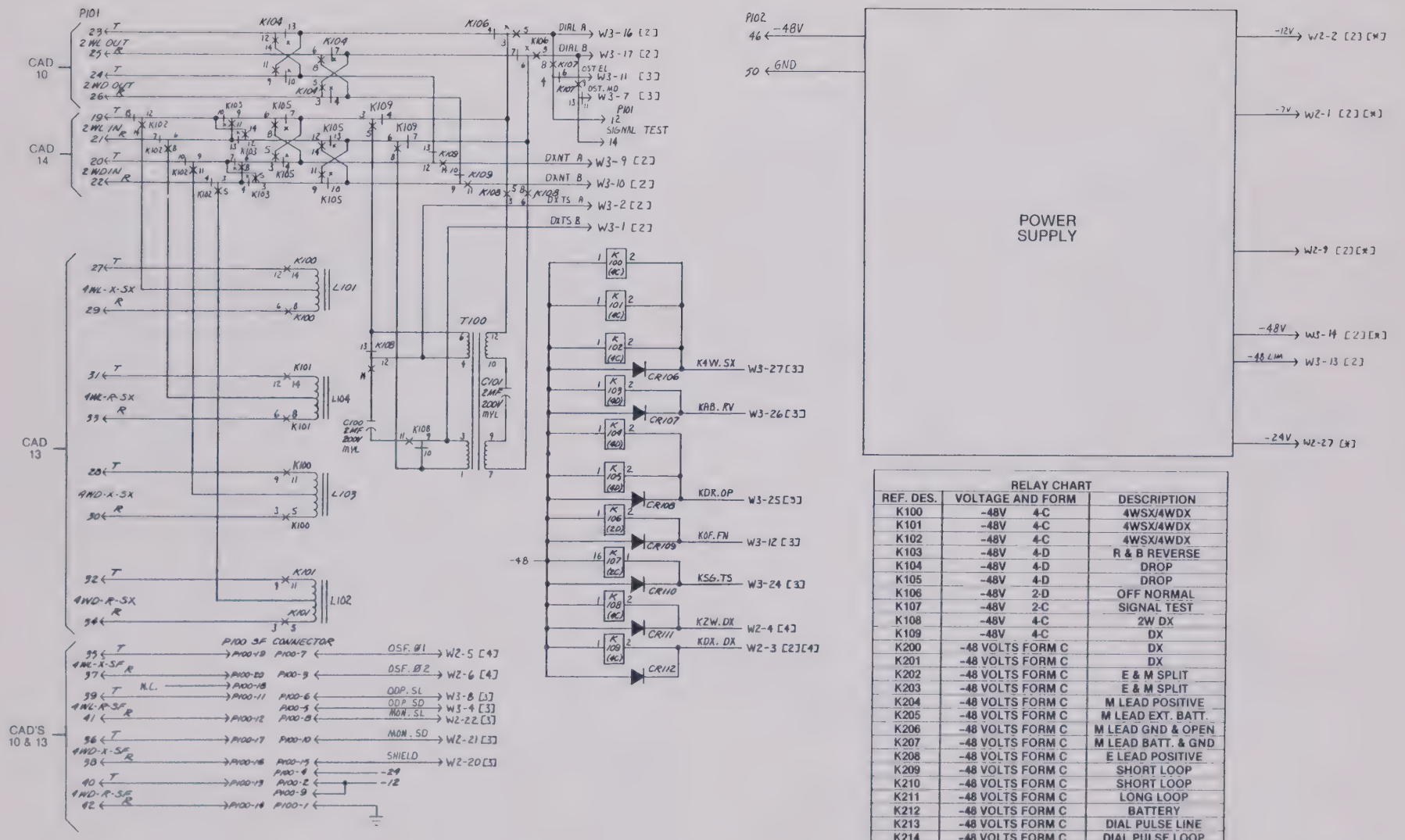
ADC

1400 TEST FACILITY SCHEMATIC
1443C VOM MODULE

DRAWING NUMBER	REVISION	SHEET
SD1400-006	C	1 OF 2



1400 TEST FACILITY SCHEMATIC 1443C VOM MODULE		
DRAWING NUMBER SD1400-006	REVISION C	SHEET 2 OF 2



RELAY CHART		
REF. DES.	VOLTAGE AND FORM	DESCRIPTION
K100	-48V 4-C	4WSX/4WDX
K101	-48V 4-C	4WSX/4WDX
K102	-48V 4-C	4WSX/4WDX
K103	-48V 4-D	R & B REVERSE
K104	-48V 4-D	DROP
K105	-48V 4-D	DROP
K106	-48V 2-D	OFF NORMAL
K107	-48V 2-C	SIGNAL TEST
K108	-48V 4-C	2W DX
K109	-48V 4-C	DX
K200	-48 VOLTS FORM C	DX
K201	-48 VOLTS FORM C	DX
K202	-48 VOLTS FORM C	E & M SPLIT
K203	-48 VOLTS FORM C	E & M SPLIT
K204	-48 VOLTS FORM C	M LEAD POSITIVE
K205	-48 VOLTS FORM C	M LEAD EXT. BATT.
K206	-48 VOLTS FORM C	M LEAD GND & OPEN
K207	-48 VOLTS FORM C	M LEAD BATT. & GND
K208	-48 VOLTS FORM C	E LEAD POSITIVE
K209	-48 VOLTS FORM C	SHORT LOOP
K210	-48 VOLTS FORM C	SHORT LOOP
K211	-48 VOLTS FORM C	LONG LOOP
K212	-48 VOLTS FORM C	BATTERY
K213	-48 VOLTS FORM C	DIAL PULSE LINE
K214	-48 VOLTS FORM C	DIAL PULSE LOOP

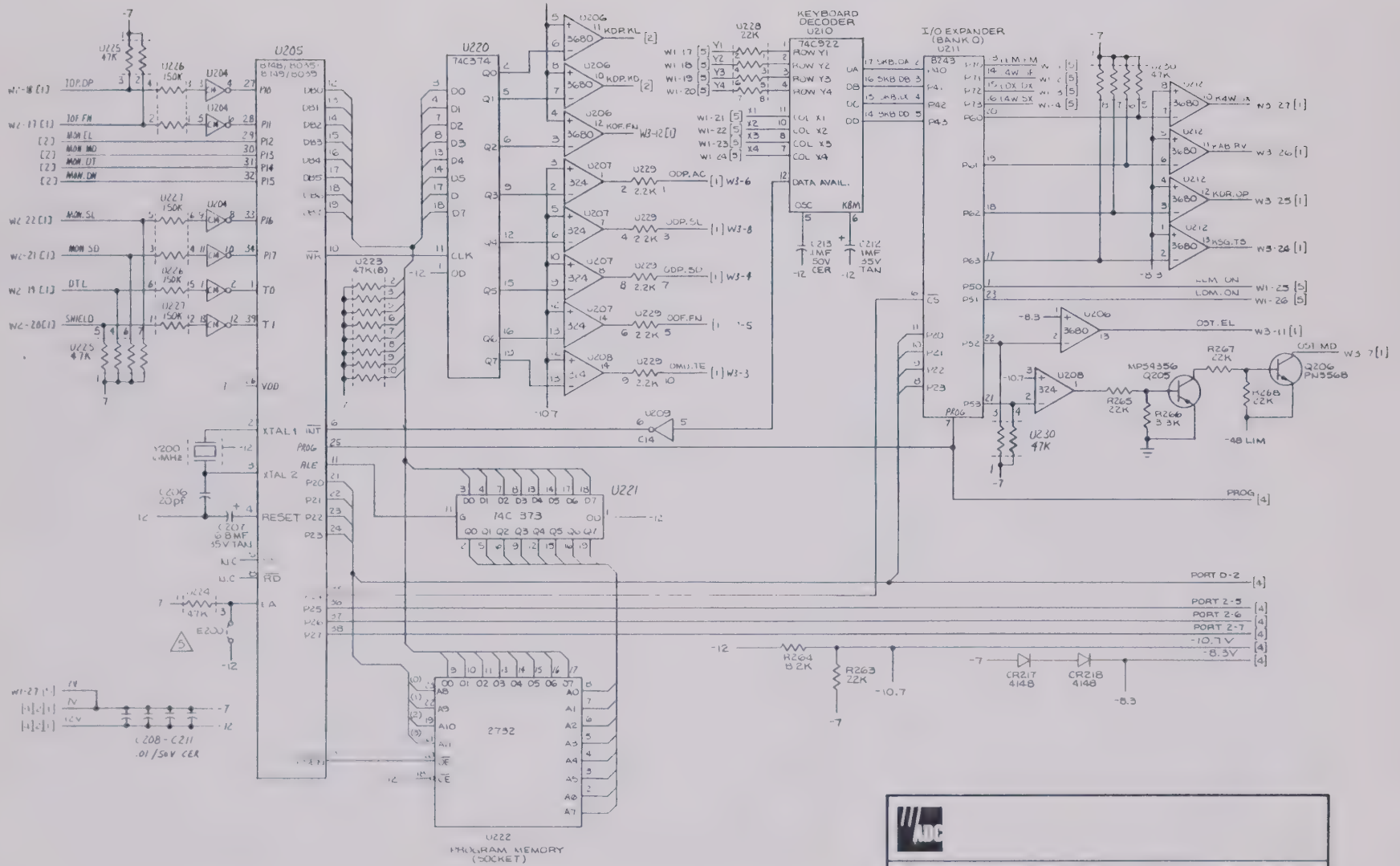
	PIN		
6X BATT	49	EXT BATT	W3-15 [2]
CAD 12 DIAL PULSE IN 1		IDP.DP	W2-18 [3]
CAD 10 DIAL PULSE OUT 2		ODP.RC	W3-6 [3]
CAD 12 DP MUTE IN	5	IOF.FN	W2-17 [3]
CAD 10 DP MUTE OUT 4		ODF.FN	W3-5 [3]
CAD 10 4 WL IN	5	I4W.LN	W2-26 [4]
CAD'S 10 & 12 TT MUTE OUT 6		OMU.TE	W3-3 [3]
CAD 10 2 WL IN	7	I2W.LN	W2-25 [4]
4W SX/E+M CONT. OUT	8	OSP.AR	W2-8 [3]

	PIN		
CAD 10 4 WD IN	9	I4W.DR	W2-24 [4]
RINGING 86	10	IOR.NG	W2-7 [3]
CAD 10 2 WD IN	11	I2W.DR	W2-23 [4]
CAD 11 DIAL TIE LINE	13	DTL	W2-19 [3]
CAD 14 E+M LINE-E	15	EM-EL	W3-22 [2]
E+M DROP-E	16	EM-ED	W3-21 [2]
E+M LINE-M	17	EM-ML	W3-20 [3]
E+M DROP-M	18	EM-MD	W3-19 [2]

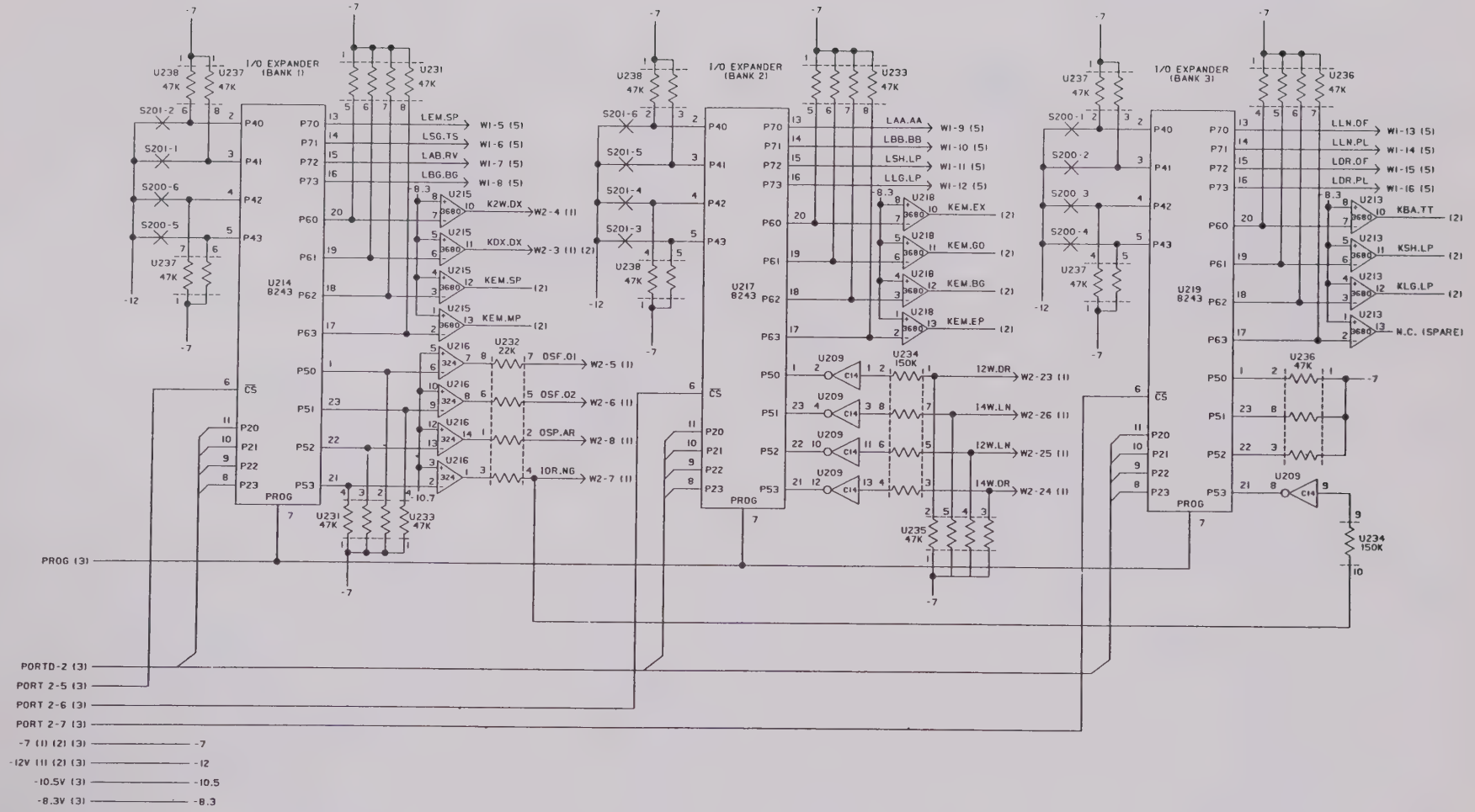
ADC

1400 TEST FACILITY SCHEMATIC
1462 SUPERVISION MODULE

DRAWING NUMBER	REVISION	SHEET
SD1400-007	B	1 OF 5

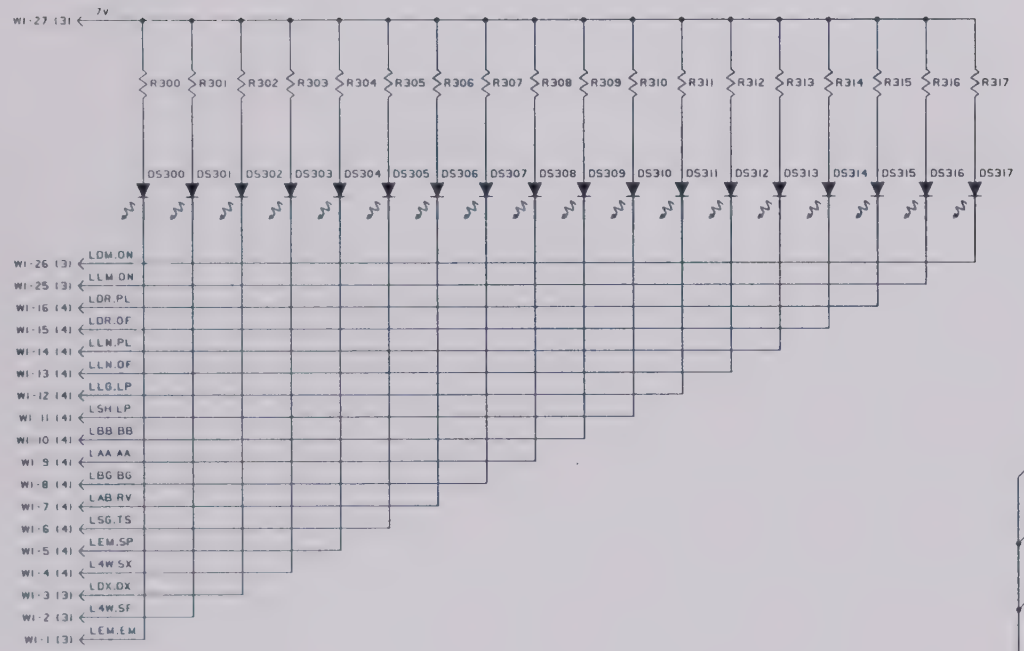


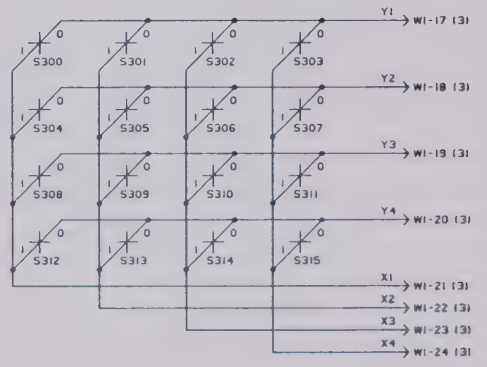
1400 TEST FACILITY SCHEMATIC 1462 SUPERVISION MODULE		
DRAWING NUMBER SD1400-007	REVISION B	SHEET 3 OF 5



1400 TEST FACILITY SCHEMATIC
1462 SUPERVISION MODULE

DRAWING NUMBER	REVISION	SHEET
SD1400-007	B	4 OF 5


7V
WI-27 (3)
R300 R301 R302 R303 R304 R305 R306 R307 R308 R309 R310 R311 R312 R313 R314 R315 R316 R317
DS300 DS301 DS302 DS303 DS304 DS305 DS306 DS307 DS308 DS309 DS310 DS311 DS312 DS313 DS314 DS315 DS316 DS317
WI-26 (3) LDM.ON
WI-25 (3) LLM.ON
WI-16 (4) LDR.PL
WI-15 (4) LDR.OF
WI-14 (4) LLN.PL
WI-13 (4) LLN.OF
WI-12 (4) LLG.LP
WI-11 (4) LSH.LP
WI-10 (4) LBB.BB
WI-9 (4) LAA.AA
WI-8 (4) LBG.BG
WI-7 (4) LAB.RV
WI-6 (4) LSG.TS
WI-5 (4) LEM.SP
WI-4 (4) L4W.SX
WI-3 (3) LDX.OX
WI-2 (3) L4W.SF
WI-1 (3) LEM.EM



1400 TEST FACILITY SCHEMATIC
1462 SUPERVISION MODULE

DRAWING NUMBER	REVISION	SHEET
SD1400-007	B	5 OF 5

ADCP-66-156

1400 Test Facility User Manual

Volume 3

Circuit Description
Fault Isolation
Repair
Calibration
General Information

2-33217-0030

ADCP-66-156
4th Edition, Issue 2, November 1984

1400 Test Facility User Manual

Volume 3

Circuit Description
Fault Isolation
Repair
Calibration
General Information

2-33217-0030

REVISION HISTORY

REVISION	DATE	REASON FOR CHANGE	REVISION	DATE	REASON FOR CHANGE
1st Edition Issue 1	9/15/80	Original			
1st Edition Issue 2	8/1/81	Monitor/Talk Changes			
2nd Edition Issue 1	1/2/83	Deleted 1480 Module and Added 1461 and 1462 Modules			
2nd Edition Issue 2	4/1/83	Technical Changes			
3rd Edition Issue 1	12/1/83	Replaced 1412C, 1422, 1432, 1433, and 1443C Module Figures to Depict New Front Panel Layouts			
4th Edition Issue 1	5/1/84	Incorporated 1461 and 1462 SF Printed Circuit Board Redesign Changes and Technical Revisions			
4th Edition Issue 2	11/21/84	Deleted 1461 Supervision Module			

EFFECTIVE PAGES

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***Indicates pages changed, added or deleted by current change.**

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INTRODUCTION

This is Volume 3 of the User Manual for ADC's 1400 Series Test Facilities shown on page iv. The manual is arranged in three volumes as follows:

Volume 1—Description and Operation.

Section 1—Description:

- Physical and Functional Description
- Description of Controls and Indicators
- System Specifications

Section 2—Operation:

- Step-by-Step Procedures to Perform Each Test Facility Function

Volume 2—Site Preparation and Installation

Section 1—Site Preparation:

- Test Facility Dimensions and Weight
- Environmental and Power Requirements
- Office Interface Requirements
- Installation Tools and Equipment

Section 2—Installation:

- Uncrating and Inspection
- Physical and Electrical Installation
- Installation/Strapping Options
- Installation Checkout Procedures

Section 3—J Drawings:

- Equipment Requirements and Options
- Equipment/Subassembly Part Numbers
- Assembly Drawings

Section 4—T Drawings:

- Cable and Power Distribution Diagrams
- Cable Assignment Drawings
- Connector/Terminal Block Drawings

Section 5—SD Drawings:

- Schematic Diagrams

Volume 3—Maintenance and Calibration

Section 1—Circuit Description:

- Overall Block Diagram
- General Circuit Description and Theory of Operation

Section 2—Fault Isolation:

- Troubleshooting Tables

Section 3—Repair:

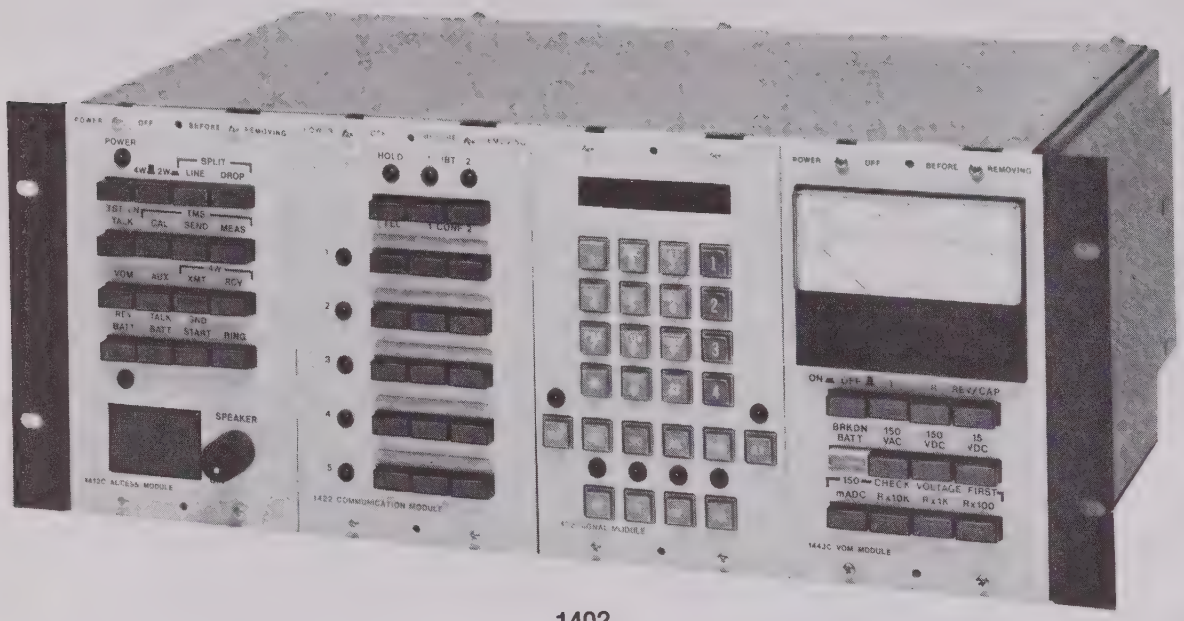
- Module/Subassembly Replacement/Repair

Section 4—Calibration:

- System Tolerances and Calibration Procedures

Section 5—General Information:

- Warranty
- Repair/Exchange Policy and Charges
- Customer Services



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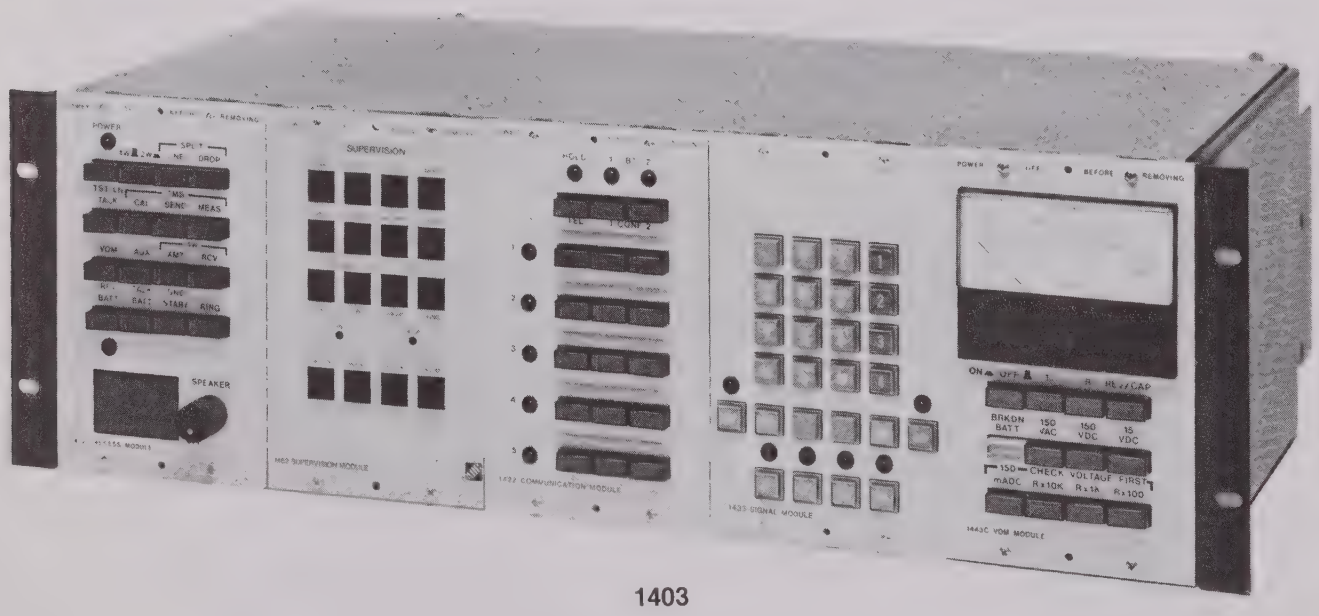

1403

TYPICAL 1400 TEST FACILITIES

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SECTION 1
CIRCUIT DESCRIPTION

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1. GENERAL

1.01 This section provides a circuit overview of a fully configured 1400 Test Facility, to aid the user in identifying circuitry which might contribute to specific Test Facility failures. Included in this section is an overall functional drawing and description of the Test Facility, and a brief definition of the functions provided by each Test Facility module.

2. FUNCTIONAL OVERVIEW

2.01 An overall functional drawing of the 1400 Test Facility is provided in Figure 1-1. The Test Facility consists of telephone circuit selection, test, and signaling circuitry located in the various test and signaling modules.

TELEPHONE CIRCUIT ACCESS

2.02 The telephone circuit to be tested or signaled is accessed via test cords in the Cord Reel Panel, or by patch cords plugged into the Test Access Jackfield. The accessed circuit is connected through the cord reel/test jack to the circuit selector in the 1412C Access Module and the 1462 Supervision Module.

TELEPHONE CIRCUIT SELECTION

2.03 The circuit selectors, under control of Test Facility front panel pushbuttons, connect the accessed telephone circuit to the 1412C and 1462 function selectors. Circuits accessed can be connected on a bridged or terminated basis, again as determined by front panel pushbutton settings.

A. 1412C Circuit Selection

2.04 The 1412C circuit selector connects accessed two- and four-wire circuits directly to function select circuitry in the 1412C Access Module. All circuit select pushbuttons are on the 1412C front panel.

B. 1462 Circuit Selection

2.05 The 1462 circuit selector connects accessed two- and four-wire and E & M circuits to function select circuitry in the 1462 Supervision Module. Accessed circuits are selected and split at the 1412C and 1462 front panels.

FUNCTION SELECTION

2.062 The 1412C and 1462 function selector connect the selected circuit to test and signaling circuitry in one or more of the Test Facility modules. Tests and functions which can be performed, and location of the corresponding circuitry are as follows:

A. 1412C Function Selector

2.07 Functions provided by or through the 1412C Access Module are:

(a) Bridged and terminated monitoring by use of amplifiers and speaker in the 1412C Module, or amplifiers in the 1412C Module and headset plugged into Test Facility headset jacks.

(b) Terminated talking by use of amplifiers in the 1412C Module and headset plugged into Test Facility headset jacks.

(c) Ringing signal generation by use of office-provided ringing signal source.

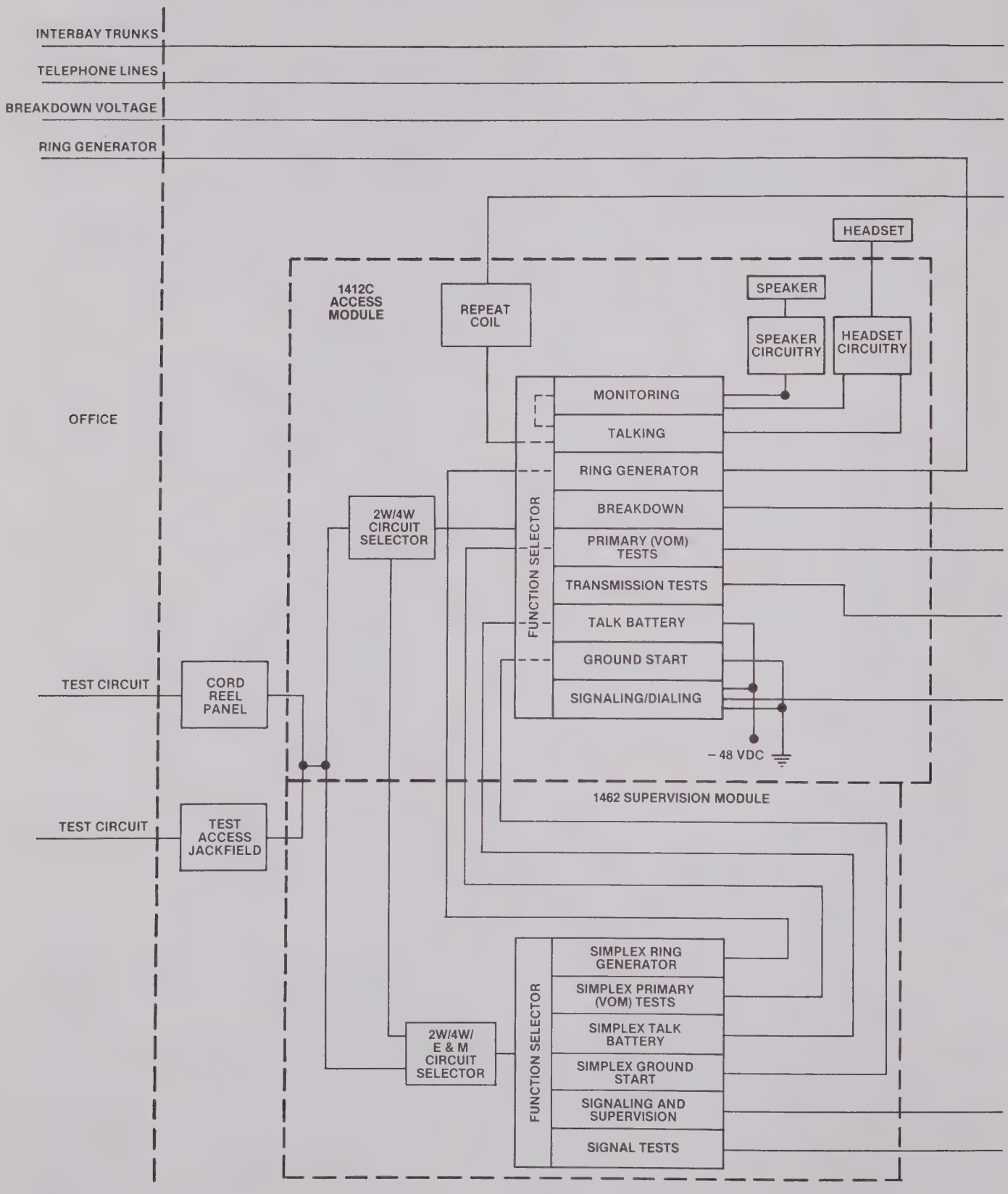
(d) Breakdown functions by use of office-provided breakdown voltage and breakdown circuitry in the 1443C Module.

(e) Primary (VOM) testing by use of VOM circuitry and meter in the 1443C Module or in an auxiliary DVOM.

(f) Transmission testing by use of an auxiliary transmission test set.

(g) Talk battery for dry four-wire simplex and two-wire circuits, by use of –48 Vdc provided within the 1412C Access Module.

(h) Ground start by use of ground provided within the 1412C Access Module.


INTERBAY TRUNKS
TELEPHONE LINES
BREAKDOWN VOLTAGE
RING GENERATOR
OFFICE
HEADSET
1412C ACCESS MODULE
REPEAT COIL
SPEAKER
SPEAKER CIRCUITRY
HEADSET CIRCUITRY
MONITORING
TALKING
RING GENERATOR
BREAKDOWN
PRIMARY (VOM) TESTS
TRANSMISSION TESTS
TALK BATTERY
GROUND START
SIGNALING/DIALING
FUNCTION SELECTOR
2W/4W CIRCUIT SELECTOR
– 48 VDC
TEST CIRCUIT
CORD REEL PANEL
TEST CIRCUIT
TEST ACCESS JACKFIELD
1462 SUPERVISION MODULE
SIMPLEX RING GENERATOR
SIMPLEX PRIMARY (VOM) TESTS
SIMPLEX TALK BATTERY
SIMPLEX GROUND START
SIGNALING AND SUPERVISION
SIGNAL TESTS
FUNCTION SELECTOR
2W/4W/ E & M CIRCUIT SELECTOR

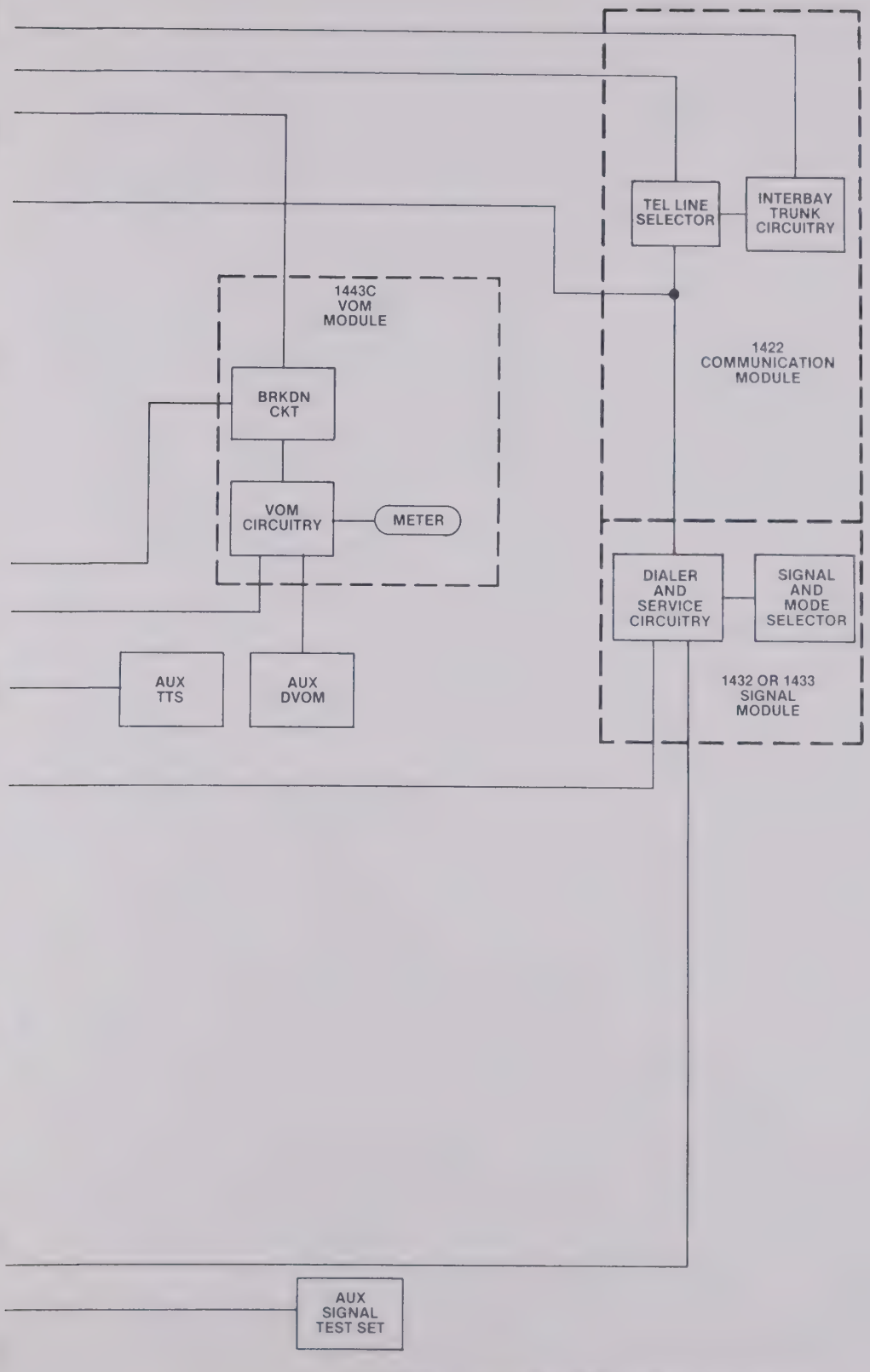


Figure 1-1. 1400 Test Facility Functional Block Diagram

(i) Two-wire loop/B & G signaling by use of signaling circuitry in the 1432 or 1433 Signal Module, and dial pulse relay in the 1412C Access Module.

(j) Two-wire or four-wire TT® and MF signaling by use of signaling circuitry in the 1432 or 1433 Signal Module, and repeat coil in the 1412C Access Module.

B. 1462 Function Selector

2.08 Functions provided by or through the 1462 Supervision Module are:

(a) Simplex ringing signal generation by use of selection circuitry in the 1412C Access Module, and office-provided ringing signal source.

(b) Simplex primary (VOM) testing by use of selection circuitry in the 1412C Access Module, and VOM circuitry and meter in the 1443C VOM Module or an auxiliary DVOM.

(c) Simplex talk battery by use of –48 Vdc provided by the 1412C Access Module.

(d) Simplex ground start by use of ground provided by the 1412C Access Module.

(e) Two-wire loop/B & G, four-wire simplex loop/B & G, two- and four-wire duplex, four-wire SF (B versions only), and E & M signaling and supervision, by use of signaling and supervision circuitry in the 1462 Supervision Module and 1432/1433 Signal Module.

(f) Two-wire loop/B & G, four-wire simplex loop/B & G, two- and four-wire duplex, four-wire SF (B versions only), and E & M signal testing, by use of signal test circuitry in an auxiliary signal test set.

3. MODULE DESCRIPTION

3.01 All Test Facility modules are described in detail in Volume 1, Section 1 of this user manual.

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SECTION 2
FAULT ISOLATION

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2. FAULT ISOLATION TABLES 2-1
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TABLE DESCRIPTION AND USE 2-1
MODULE REPLACEMENT 2-1
3. PRE-TEST CONSIDERATIONS 2-1
4. WARNINGS AND CAUTIONS 2-2
5. PROBLEMS 2-2
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1. GENERAL

1.01 This section provides information necessary to locate a malfunctioning module in the event of a 1400 Test Facility failure. The information is presented in easy to follow tables, allowing effective use by maintenance technicians with an average background in telephone electronics.

2. FAULT ISOLATION TABLES

TABLE ORGANIZATION

2.01 The fault isolation tables are organized and numbered to correlate directly with the operating procedures of Volume 1 of this user manual. Each table provides fault isolation of problems occurring during performance of the corresponding Test Facility operating procedure. In addition, a fault isolation table for Test Facility power supply failures is provided at the back of this section.

TABLE DESCRIPTION AND USE

2.02 Each table lists the possible symptoms for problems occurring during performance of the corresponding operating procedure of Volume 1. To the right of each symptom or set of symptoms, are listed the Test Facility modules or cord reels/patch cords which may have failed, causing each problem and symptom.

2.03 When a problem and symptom are found in the table, the possible faulty items should be checked and/or replaced in the order shown, since their order takes into consideration:

(a) Probability of their causing the problem.

(b) Ease of check or replacement.

MODULE REPLACEMENT

2.04 Test Facility modules (1412C, 1422, etc.) should be replaced one at a time WITH TEST FACILITY POWER OFF; SEE WARNINGS IN PARAGRAPH 4 OF THIS SECTION. If module replacement does not correct the problem, the original module should be returned to the Test Facility. If module replacement corrects the problem, the replacement module should be left in the Test Facility, and faulty module sent to ADC for repair (see the General Information section of this volume). Refer to the Repair section of this volume for module replacement procedures.

3. PRE-TEST CONSIDERATIONS

3.01 The fault isolation tables described in the preceding paragraphs do not consider failures in voltage supply circuits. These failures may also cause the symptoms listed, or may cause other symptoms not listed. It is therefore recommended that the power supply output voltages be checked before beginning fault isolation. Any voltage failures found should be referred to the dc Voltage Supply table at the back of this section.

3.02 Dc output voltages from the Test Facility 1402/1403 shelf power supply should measure as shown in Table 2-1. Voltages should be measured using a digital voltmeter at the rear of the Test Facility.

Table 2-1
Power Supply Output Voltages

VOLTMETER CONNECTED ACROSS	MEASURED VOLTAGE
TB2-3 (–) and TB2-48 (+)	48 Vdc (Office battery)
TB2-1 (–) and TB2-48 (+)	48 Vdc (Office battery)
TB2-8 (–) and TB2-48 (+)	24 Vdc ±1.0 Vdc
TB2-16 (–) and TB2-48 (+)	12 Vdc ±0.5 Vdc

4. WARNINGS AND CAUTIONS

4.01 The following warnings and cautions must be remembered when troubleshooting a malfunctioning Test Facility. Space does not allow their inclusion with pertinent steps in each table.

Warning 1: Since voltage measurements are made with all Test Facility power applied, care must be taken to avoid contact with hazardous voltages. In addition, to avoid equipment damage, test points must never be shorted together or to ground.

Warning 2: Test Facility power must be turned off or disconnected at the office distribution panel when doing any work in or near the Test Facility power supply. Power must also be off or disconnected when replacing modules.

Caution 1: Static discharge of personnel may cause damage to some circuit cards. Always discharge static through a convenient ground before contacting a circuit card.

Caution 2: Central Office ground must be used as the ground point for external test equipment used in Test Facility checkout or troubleshooting (refer to T1400-002 for Central Office ground point locations). Do not use 12 Vdc Common as a ground point since this point is actually at –12 Vdc with respect to Central Office ground.

5. PROBLEMS

5.01 If following the recommendations of the fault isolation tables does not correct the problem, more extensive troubleshooting methods will be required. If the system is still under warranty, do not attempt further servicing. Contact ADC Field Service as described in the General Information section of this volume.

FAULT ISOLATION TABLES

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1. TWO-WIRE MONITOR — BRIDGED/TERMINATED

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Monitor problems on both line and drop side of circuit; circuit in use is not interrupted during bridged monitoring.	
A. Can monitor with 1412C speaker but not with Test Facility headset.	Headset or headset connections. 1412C Access Module.
B. Cannot monitor with 1412C speaker.	1412C Access Module.
II. Can monitor either line or drop side of circuit only (not both); circuit in use is not interrupted during bridged monitoring.	1412C Access Module.
III. Cannot bridge monitor without interrupting circuit in use.	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.
IV. 1412C speaker level adjustment problem only.	1412C Access Module.

2. TWO-WIRE TALK — TERMINATED

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	Headset or headset connection. 1412C Access Module.
II. Can talk and hear on either line or drop side of circuit only (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.

3, 4, 6. TWO-WIRE VOM TEST — VOLTAGE, RESISTANCE, AND CAPACITIVE KICK

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. No meter readings (all voltage and resistance ranges).	1412C Access Module. 1443C VOM Module.
B. Meter reads incorrect value for one or more voltage/ resistance ranges.	1443C VOM Module. 1412C Access Module.
C. Meter reads reversed voltage polarity.	1443C VOM Module.
II. Meter reads correct voltage and resistance values on either line or drop side of circuit only (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.

5. TWO-WIRE VOM TEST — CURRENT MEASUREMENT

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Meter reads incorrectly in both tip and ring circuits.	
A. Meter reads no current.	1412C Access Module. 1443C VOM Module.
B. Meter reads incorrect value.	1443C VOM Module. 1412C Access Module.
C. Meter reads reversed polarity.	1443C VOM Module.
II. Meter reads correct current in either tip or ring circuit only (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1443C VOM Module.

7. TWO-WIRE VOM TEST — VOLTAGE, RESISTANCE, AND CAPACITANCE MEASUREMENT ON AUXILIARY DVOM.

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. No meter readings (all meter parameters and ranges).	1412C Access Module. Auxiliary DVOM. 1443C VOM Module.
B. Meter reads incorrect value for one or more parameter and/or range.	Auxiliary DVOM. 1412C Access Module. 1443C VOM Module.
C. Meter reads reversed voltage polarity.	Auxiliary DVOM.
II. Meter reads correct values on either line or drop side of circuit only (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.

8. TWO-WIRE VOM TEST — CURRENT MEASUREMENT ON AUXILIARY DVOM

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Meter reads incorrectly in both tip and ring circuits.	
A. Meter reads no current.	1412C Access Module. Auxiliary DVOM. 1443C VOM Module.
B. Meter reads incorrect value.	Auxiliary DVOM. 1412C Access Module. 1443C VOM Module.
C. Meter reads reversed polarity.	Auxiliary DVOM.
II. Meter reads correct current in either tip or ring circuit only (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1443C VOM Module. Auxiliary DVOM.

9. TWO-WIRE VOM TEST — BREAKDOWN

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. No voltage applied to circuit and no meter reading.	Office breakdown voltage supply. 1443C VOM Module.
II. Meter reads correct voltage value, but voltage is not applied to tip and/or ring circuit.	**2W DROP** cord reel or patch cord. 1412C Access Module. 1443C VOM Module.
III. Correct voltage is applied to circuit, but meter reads incorrectly.	1443C VOM Module.

10. TWO-WIRE TRANSMISSION TEST

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. TTS displays indicate correctly during TTS calibration test but incorrectly during TTS test.	1412C Access Module.
B. TTS displays indicate incorrectly during both TTS calibration test and TTS test.	Auxiliary TTS. 1412C Access Module.
II. Can send and receive/measure tone on either line or drop side of circuit only (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.

11. TWO-WIRE SIGNAL TEST — SEND AND MEASURE LOOP/B & G PULSES

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. Can neither send nor receive/measure signals.	Auxiliary Signal Test Set. 1462 Supervision Module.
B. Can either send or receive/measure signals (not both).	Auxiliary Signal Test Set. 1462 Supervision Module.
C. Any other signal send or measure problems.	Auxiliary Signal Test Set.
II. Can send and receive/measure signals on either line or drop side of circuit (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1462 Supervision Module.

12. TWO-WIRE SIGNALING — SEND RINGING SIGNAL

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Can apply ringing signal to neither line nor drop side of circuit.	Office ringing signal source. 1412C Access Module.
II. Can apply ringing signal to either line or drop side of circuit only (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.

13. TWO-WIRE SIGNALING — SEND GROUND START

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Can apply ground start to neither line nor drop side of circuit.	1412C Access Module.
II. Can apply ground start to either line or drop side of circuit only (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.

14. TWO-WIRE TALK BATTERY — SEND

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Can apply talk battery to neither line nor drop side of circuit.	1412C Access Module.
II. Can apply talk battery to either line or drop side of circuit only (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.
III. Incorrect polarity talk battery is sent.	1412C Access Module.

15. TWO-WIRE LOOP SIGNALING

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. No signaling possible (all Signal Module modes).	1412C Access Module. 1432 or 1433 Signal Module. 1462 Supervision Module. 1422 Communication Module.
B. Can signal in DP Mode only.	1432 or 1433 Signal Module. 1412C Access Module.
C. Can signal in TT and MF Modes only.	1432 or 1433 Signal Module. 1462 Supervision Module.
D. Can signal in all Signal Module modes but not all digits.	1432 or 1433 Signal Module.
II. Can signal on either line or drop side of circuit only (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1462 Supervision Module.

16, 18. TWO-WIRE LOOP/B & G AND DUPLEX SIGNALING (VIA SUPERVISION MODULE)

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. No signaling possible (all Signal Module modes).	1462 Supervision Module. 1432 or 1433 Signal Module 1412C Access Module. 1422 Communication Module.
B. Can signal in DP Mode only.	1432 or 1433 Signal Module. 1412C Access Module.
C. Can signal in TT and MF Modes only.	1432 or 1433 Signal Module. 1462 Supervision Module.
D. Can signal in all Signal Module modes, but not all digits.	1432 or 1433 Signal Module.
E. All other conditioning and signaling problems.	1462 Supervision Module.
II. Can signal on either line or drop side of circuit only (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1462 Supervision Module.

17. TWO-WIRE DUPLEX SIGNAL TEST — MONITOR/MEASURE PULSES

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. Can neither measure pulses on Signal Test Set, nor monitor on 1462 **LINE/DROP** indicators.	1462 Supervision Module.
B. Can measure pulses on Signal Test Set, but cannot monitor on 1462 **LINE/DROP** indicators.	1462 Supervision Module.
C. Can monitor pulses on 1462 **LINE/DROP** indicators, but cannot measure on Signal Test Set.	Auxiliary Signal Test Set. 1462 Supervision Module.
II. Can monitor and measure pulses on either line or drop side of circuit only (not both).	**2W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1462 Supervision Module.

19. FOUR-WIRE MONITOR — BRIDGED/TERMINATED

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Monitor problems on both line and drop side of circuit; circuit in use is not interrupted during bridged monitoring.	
A. Can monitor with 1412C speaker but not with Test Facility headset.	Headset or headset connections. 1412C Access Module.
B. Cannot monitor with 1412C speaker.	1412C Access Module.
C. Cannot monitor transmit and/or receive pair.	1412C Access Module.
II. Can monitor either line or drop side of circuit only (not both); circuit in use is not interrupted during bridged monitoring.	1412C Access Module.
III. Cannot bridge monitor without interrupting circuit in use.	**4W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.
IV. 1412C speaker level adjustment problem only.	1412C Access Module.

20. FOUR-WIRE TALK — TERMINATED

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. Can talk and hear on either transmit or receive pair only (not both).	1412C Access Module.
B. Can talk and hear on neither transmit nor receive pair.	Headset or headset connections. 1412C Access Module.
C. Can either talk or hear only (not both).	1412C Access Module.
II. Can talk and hear on either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.

21, 22, 23. FOUR-WIRE VOM TEST — VOLTAGE, RESISTANCE, AND CAPACITIVE KICK

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. Problems on both transmit and receive pair.	
1. No meter readings (all voltage and resistance ranges).	1412C Access Module. 1443C VOM Module.
2. Meter reads incorrect value for one or more voltage/resistance ranges.	1443C VOM Module. 1412C Access Module.
3. Meter reads reversed voltage polarity.	1443C VOM Module.
B. Problems on either transmit or receive pair only (not both).	1412C Access Module.
II. Meter reads correct voltage and resistance values on either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.

24. FOUR-WIRE VOM TEST— VOLTAGE, RESISTANCE, AND CAPACITANCE MEASUREMENT ON AUXILIARY DVOM

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. Problems on both transmit and receive pair.	
1. No meter readings (all meter parameters and ranges).	1412C Access Module. Auxiliary DVOM. 1443C VOM Module.
2. Meter reads incorrect value for one or more parameter and/or range.	Auxiliary DVOM. 1412C Access Module. 1443C VOM Module.
3. Meter reads reversed voltage polarity.	Auxiliary DVOM.
B. Problems on either transmit or receive pair only (not both).	1412C Access Module.
II. Meter reads correct values on either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.

25. FOUR-WIRE VOM TEST — BREAKDOWN

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both transmit and receive pair.	
A. No voltage applied to circuit and no meter reading.	Office breakdown voltage supply. 1443C VOM Module.
B. Meter reads correct voltage, but voltage is not applied to tip and/or ring circuit.	1412C Access Module. 1443C VOM Module.
C. Correct voltage is applied to circuit, but meter reads incorrectly.	1443C VOM Module.
II. Can apply voltage to either transmit or receive pair only (not both).	**4W DROP XMT** or **RCV** cord reel or patch cord. 1412C Access Module.

26, 27, 28. FOUR-WIRE SIMPLEX VOM TEST — VOLTAGE, RESISTANCE, AND CAPACITIVE KICK

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. No meter readings (all voltage and resistance ranges).	1412C Access Module. 1443C VOM Module. 1462 Supervision Module.
B. Meter reads incorrect value for one or more voltage or resistance ranges.	1443C VOM Module. 1462 Supervision Module. 1412C Access Module.
C. Meter reads reversed voltage polarity.	1443C VOM Module.
II. Meter reads correct values on either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1462 Supervision Module.

29. FOUR-WIRE SIMPLEX VOM TEST — VOLTAGE, RESISTANCE, AND CAPACITANCE MEASUREMENT ON AUXILIARY DVOM

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. No meter readings (all meter parameters and ranges).	1412C Access Module. Auxiliary DVOM. 1462 Supervision Module. 1443C VOM Module.
B. Meter reads incorrect value for one or more parameter and/or range.	Auxiliary DVOM. 1462 Supervision Module. 1412C Access Module. 1443C VOM Module.
C. Meter reads reversed voltage polarity.	Auxiliary DVOM.
II. Meter reads correct values on either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1462 Supervision Module.

30. FOUR-WIRE TRANSMISSION TEST

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. Problems on both transmit and receive pair.	
1. TTS displays indicate correctly during TTS calibration test but incorrectly during TTS test.	1412C Access Module.
2. TTS displays indicate incorrectly during both calibration test and TTS test.	Auxiliary TTS. 1412C Access Module.
B. Problems on either transmit or receive pair only (not both).	1412C Access Module.
II. Can send and receive/measure tone on either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1412C Access Module.

31. FOUR-WIRE SIMPLEX SIGNAL TEST — SEND OR MEASURE LOOP/B & G PULSES

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. Can neither send nor receive/measure signals.	Auxiliary Signal Test Set. 1462 Supervision Module. 1412C Access Module.
B. Can either send or receive/measure signals (not both).	Auxiliary Signal Test Set. 1462 Supervision Module.
C. Any other signal send/measure problems.	Auxiliary Signal Test Set.
II. Can send and receive/measure signals on either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1462 Supervision Module. 1412C Access Module.

32. FOUR-WIRE SIMPLEX SIGNALING — SEND RINGING SIGNAL

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Can apply ringing signal to neither line nor drop side of circuit.	Office ringing signal source. 1412C Access Module.
II. Can apply ringing signal to either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1462 Supervision Module.

33. FOUR-WIRE SIMPLEX SIGNALING — SEND GROUND START

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Can apply ground start to neither line nor drop side of circuit.	1412C Access Module.
II. Can apply ground start to either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1462 Supervision Module.

34. FOUR-WIRE SIMPLEX TALK BATTERY — SEND

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Can apply talk battery to neither line nor drop side of circuit.	1412C Access Module.
II. Can apply talk battery to either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1462 Supervision Module.
III. Incorrect polarity talk battery is sent.	1412C Access Module.

35. FOUR-WIRE SIMPLEX LOOP/B & G SIGNALING

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. No signaling possible (all Signal Module modes).	1462 Supervision Module 1432 or 1433 Signal Module. 1412C Access Module. 1422 Communication Module.
B. Can signal in DP Mode only.	1432 or 1433 Signal Module. 1412C Access Module.
C. Can signal in TT and MF Modes only.	1432 or 1433 Signal Module. 1462 Supervision Module.
D. Can signal in all Signal Module modes, but not all digits.	1432 or 1433 Signal Module.
II. Can signal on either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1462 Supervision Module. 1412C Access Module.

36, 38. FOUR-WIRE DUPLEX AND SF SIGNAL TESTS — MONITOR/MEASURE PULSES

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. Can neither measure pulses on Signal Test Set, nor monitor on 1462 **LINE/DROP** indicators.	1462 Supervision Module.
B. Can measure pulses on Signal Test Set, but cannot monitor on 1462 **LINE/DROP** indicators.	1462 Supervision Module.
C. Can monitor pulses on 1462 **LINE/DROP** indicators, but cannot measure on Signal Test Set.	Auxiliary Signal Test Set. 1462 Supervision Module.
II. Can monitor and measure pulses on either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1462 Supervision Module.

37, 39. FOUR-WIRE DUPLEX OR SF SIGNALING

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. No signaling possible (all Signal Module modes).	1462 Supervision Module. 1432 or 1433 Signal Module. 1412C Access Module. 1422 Communication Module.
B. Can signal in DP Mode only.	1432 or 1433 Signal Module. 1412C Access Module.
C. Can signal in TT and MF Modes only.	1432 or 1433 Signal Module. 1462 Supervision Module.
D. Can signal in all Signal Module modes, but not all digits.	1432 or 1433 Signal Module.
E. All other conditioning and signaling problems.	1462 Supervision Module.
II. Can signal on either line or drop side of circuit only (not both).	**4W LINE** or **DROP** cord reel or patch cord. 1412C Access Module. 1462 Supervision Module.

40. E & M SIGNAL TEST — MONITOR/MEASURE PULSES

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. Can neither measure pulses on Signal Test Set, nor monitor on 1462 **LINE/DROP** indicators.	1462 Supervision Module.
B. Can measure pulses on Signal Test Set, but cannot monitor on 1462 **LINE/DROP** indicators.	1462 Supervision Module.
C. Can monitor pulses on 1462 **LINE/DROP** indicators, but cannot measure on Signal Test Set.	Auxiliary Signal Test Set. 1462 Supervision Module.
II. Can monitor and measure pulses on either line or drop side of circuit only (not both).	E & M **LINE** or **DROP** cord reel or patch cord. 1462 Supervision Module.

41. E & M SIGNALING

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Problems on both line and drop side of circuit.	
A. No signaling possible (all Signal Module modes).	1462 Supervision Module. 1432 or 1433 Signal Module. 1422 Communication Module.
B. Can signal but not in all Signal Module modes.	1432 or 1433 Signal Module.
C. Can signal in all Signal Module modes but not all digits.	1432 or 1433 Signal Module.
D. All other conditioning and signaling problems.	1462 Supervision Module.
II. Can signal on either line or drop side of circuit only (not both).	E & M **LINE** or **DROP** cord reel or patch cord. 1462 Supervision Module. 1412C Access Module.

42 THROUGH 48. ORIGINATE, RECEIVE, AND CONFERENCE CALLS

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
I. Can neither receive nor originate calls on:	
A. All five 1422 lines.	1422 Communication Module incorrectly programmed for type of telephone line connected (refer to Volume 2, Section 2). 1422 Communication Module. 1412C Access Module.
B. One 1422 line only.	1422 Communication Module incorrectly programmed for type of telephone line connected (refer to Volume 2, Section 2). 1422 Communication Module.
II. Problems originating calls only.	
A. Cannot originate calls (all Signal Module modes).	1432 or 1433 Signal Module. 1422 Communication Module. 1412C Access Module. 1462 Supervision Module.
B. Can signal in DP Mode only.	1432 or 1433 Signal Module. 1412C Access Module.
C. Can signal in TT and MF Modes only.	1432 or 1433 Signal Module. 1462 Supervision Module.
D. Can originate calls in all modes but not all digits.	1432 or 1433 Signal Module.
III. Problems receiving calls only.	1422 Communication Module.

42 THROUGH 48. ORIGINATE, RECEIVE, AND CONFERENCE CALLS (Continued)

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
IV. Monitor/talk problems after a call is received or placed.	
A. Cannot talk and/or hear on Test Facility headset.	Headset or headset connections. 1412C Access Module.
B. Cannot hear on headset but can talk.	1412C Access Module. 1422 Communication Module.
V. Cannot place calls on hold, or remove calls from hold.	1422 Communication Module.
IV. Problems conferencing calls within the 1422 and/or on interbay trunks.	1422 Communication Module.

DC VOLTAGE SUPPLY AND DISTRIBUTION

PROBLEM/SYMPTOM	POSSIBLE FAULT LOCATION
Warning: Test Facility power must be turned off or disconnected at the office distribution panel when doing any work in or near the Test Facility power supply.	
I. No voltage on 1402/1403 TB2-3 with respect to 1402/1403 TB2-48.	Office battery supply. 1402/1403 power supply fuse. If replacement fuse also blows, remove Test Facility modules* one at a time to isolate excessive current drain. If fuse blows with all modules removed, replace the 1402/1403 Power Supply and Transistor Pass Unit and Regulator Assemblies. *After the 1412C Access Module is removed, carefully install a jumper between TB2-1 and TB2-3 at the back of the Test Facility, to restore Test Facility power. Remove this jumper before re-installing the 1412C Access Module. 1402/1403 Power Supply Module.
II. Correct voltage on 1402/1403 TB2-3 with respect to 1402/1403 TB2-48.	
A. No voltage on 1402/1403 TB2-1 with respect to 1402/1403 TB2-48.	1412C Access Module.
B. Correct voltage on 1402/1403 TB2-1 with respect to 1402/1403 TB2-48, but any other voltage(s) missing or incorrect.	1402/1403 Power Supply Module. 1402/1403 Transistor Pass Unit Assembly. 1402/1403 Transistor Regulator Assembly.

SECTION 3
REPAIR

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1. GENERAL

1.01 This section provides instructions for replacing failed Test Facility modules or components to correct failures isolated in Section 2 of this volume. Items to be repaired should be returned to ADC as described in Section 5.

2. TEST FACILITY REPAIR

2.01 Faults identified in Section 2 of this volume are isolated to one of the following items:

(a) Replaceable module.

(b) Replaceable Test Facility power supply module.

(c) Replaceable power supply fuse.

(d) Repairable Cord Reel Panel.

2.02 Repair of the Test Facility consists only of replacing or repairing these items as described in the following paragraphs.

Warning: Disconnect all power from the Test Facility before performing any of the following procedures. Failure to do so may result in injury to personnel or damage to the equipment.

Caution: Static discharge of personnel can cause damage to some circuit cards. Always discharge static through a convenient ground before contacting a circuit card.

TEST AND SIGNAL MODULES

2.03 Replace 1412C, 1422, 1432, 1433, 1443C, and 1462 Modules as follows:

(a) If the module to be replaced is a 1422 Communiction Module, unplug the telephone line connector from P1 at the rear of the module.

(b) Remove the top and bottom plastic trim strips.

(c) Remove the module retaining screws at center top and center bottom of the module front panel.

(d) Unplug the module, and remove it from the Test Facility shelf.

(e) Configure the replacement module (straps, switches, and adjustments) identically to the module being replaced. Refer to Volume 2, Section 2 if necessary.

(f) Slide replacement module into correct space and press it into the rear panel connectors.

(g) Reinstall the two module retaining screws and plastic trim strips.

(h) If the module replaced is a 1422 Communication Module, plug the telephone line connector to P1 at the rear of the module.

POWER SUPPLY MODULE

2.04 Replace the 1402/1403 shelf power supply module as follows:

(a) Locate the power supply module at the rear of the Test Facility shelf (behind the 1412C module).

(b) Unplug the connector from the top of the power supply module.

(c) Remove the four hexagonal standoffs holding the module to the back of the shelf, and remove the module from the shelf.

(d) Install replacement module by performing steps b and c in reverse order.

POWER SUPPLY TRANSISTOR ASSEMBLIES

2.05 Replace the power supply transistor assemblies as follows:

(a) Disconnect input office battery.

(b) Locate the transistor assembly to be replaced at the rear of the Test Facility shelf. When facing the shelf from the rear, the regulator assembly is at the left and the pass unit assembly is at the right.

(c) Unplug the connector from the bottom of the assembly.

(d) Remove the three screws holding the assembly to the shelf, and remove the module from the shelf.

(e) Install replacement assembly by performing steps c and d in reverse order.

POWER SUPPLY FUSE

2.06 Replace the power supply fuse as follows:

(a) Disconnect input office battery.

(b) Locate the fuse in the power supply module at the rear of the Test Facility shelf (behind the 1412C Module).

(c) Remove the fuse from its receptacle with a fuse puller.

(d) Press replacement fuse into the receptacle.

CORD REEL PANEL

2.07 Replace Cord Reel Panel cord reels as follows:

(a) Loosen the retaining screws on each of the connectors plugged onto the back of the Cord Reel Panel, and unplug the connectors.

(b) Remove the screws holding the bracket and pluggable connectors to the back of the Cord Reel Panel, and carefully move the bracket down away from the Cord Reel Panel screw-type terminal strips.

(c) Remove the plastic terminal strip protectors from the terminal strips of the cord reel assembly to be removed.

Note: Each cord reel assembly contains four cord reels and two terminal strips. The entire assembly must be removed from the Cord Reel Panel to replace an individual cord reel.

(d) Disconnect all wires from these same two terminal strips which are connected to any of the three pluggable connectors previously removed, after marking all wires for reconnection.

(e) Remove the four screws which hold the cord reel assembly to the Cord Reel Panel, and carefully slide the assembly back from the Cord Reel Panel.

(f) Cut the Bantam or 310 Longframe plug from the cord reel to be replaced.

(g) Disconnect the end of the cord reel cable to be replaced from the screw-type terminal strip.

(h) Remove the screws which hold the cord reel to the removed cord reel assembly, and remove the cord reel from the assembly.

(i) Mount replacement cord reel on the cord reel assembly.

(j) Insert the panel end of the replacement cord reel through the correct hole in the cord reel panel, and slide the cord reel assembly onto the Cord Reel Panel.

(k) Install the appropriate cord reel repair kit on the new cord reel cable.

(l) Remount the cord reel assembly to the Cord Reel Panel, and reconnect all wires previously removed.

(m) Remount the three pluggable connectors and bracket to the back of the Cord Reel Panel.

(n) Reconnect the pluggable cable connectors to the bracket connectors, and tighten each holding screw.

SECTION 4
CALIBRATION

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3. TOOLS AND TEST EQUIPMENT 4-1
4. CORRECTIVE ACTIONS 4-1
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1443C PRIMARY TEST CIRCUITRY CALIBRATION CHECK 4-2
1462B SF CALIBRATION 4-8

1. GENERAL

1.01 This section provides procedures for maintaining calibration of the 1400 Test Facility. Calibration of the Facility should be checked in accordance with regular office equipment calibration schedules, or whenever a test inaccuracy is suspected.

2. PROCEDURE DESCRIPTION

2.01 Each calibration table consists of:

(a) Procedures for generating and/or measuring voltage/signal conditions.

(b) Voltage/signal values that must be measured for correct Test Facility calibration.

(c) Corrective action to be taken if voltage/signal measured is out of tolerance.

(d) Figures showing location of pushbuttons, test points, and adjustments.

3. TOOLS AND TEST EQUIPMENT

3.01 The calibration checks outlined in this section require the following tools and test equipment:

(a) Digital Multimeter, Fluke 8000A or equivalent.

(b) 48 Vdc power supply (nominal).

(c) 10 Vdc power supply (nominal).

(d) Ring generator.

(e) 120 kohms ±1%.

(f) 12 kohms ±1%.

(g) 1200 ohms ±1%.

(h) 0 ohms (short).

(i) Transmission Test Set (TTS).

(j) Non-metallic alignment screwdriver.

4. CORRECTIVE ACTIONS

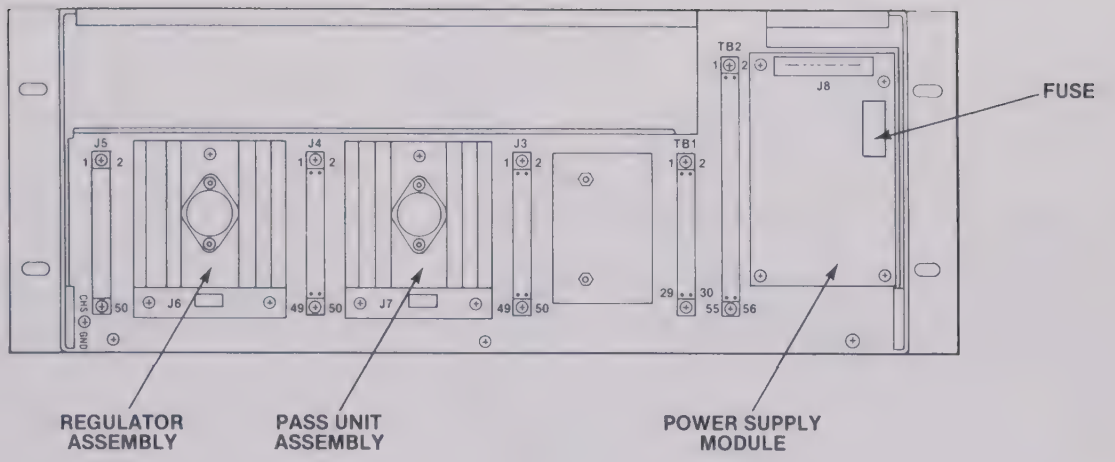
4.01 Except for the 1443C meter adjustment, all corrective actions call for Test Facility module/assembly replacement. Procedures for replacing these units are provided in Section 3 of this volume.

POWER SUPPLY CALIBRATION CHECK

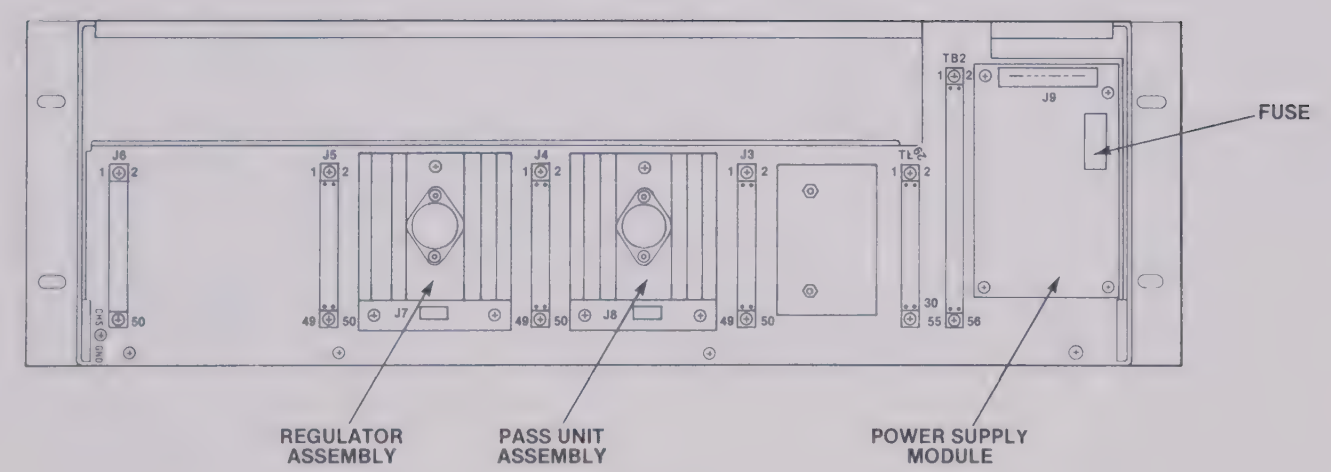
STEP	ACTION	REQUIRED VALUE	CORRECTIVE ACTION	REFERENCE
1	Measure dc voltage across TB2-3 (–) and TB2-48 (+).	47.5 to 48.5 Vdc (Office Battery)	Replace power supply fuse. Replace power supply module.	Figure 4-1
2	Measure dc voltage across TB2-1 (–) and TB2-48 (+).	Same as for Step 1	Replace 1412C Access Module.	Figure 4-1
3	Measure dc voltage across TB2-8 (–) and TB2-48 (+).	23 to 25 Vdc	Replace power supply module. Replace regulator assembly. Replace pass unit assembly.	Figure 4-1
4	Measure dc voltage across TB2-16 (–) and TB2-48 (+).	11.5 to 12.5 Vdc	Replace power supply module. Replace regulator assembly. Replace pass unit assembly.	Figure 4-1

1443C PRIMARY TEST CIRCUITRY CALIBRATION CHECK

STEP	ACTION	REQUIRED VALUE	CORRECTIVE ACTION	REFERENCE
1	Observe meter with all Test Facility pushbuttons released.	0 V-MA	Adjust screw directly under meter scale.	Figure 4-2
2	On 1412C, press **4W/2W**, **VOM**, and **LINE SPLIT** buttons.			Figure 4-3
3	On 1443C, press **ON/OFF** and **RX10K** button.			Figure 4-2
4	Connect short (0 ohms) across Cord Reel Panel/Jackfield **2W LINE** tip and ring.			



1402 TEST FACILITY SHELF



1403 TEST FACILITY SHELF

Figure 4-1. Test Facility Shelf

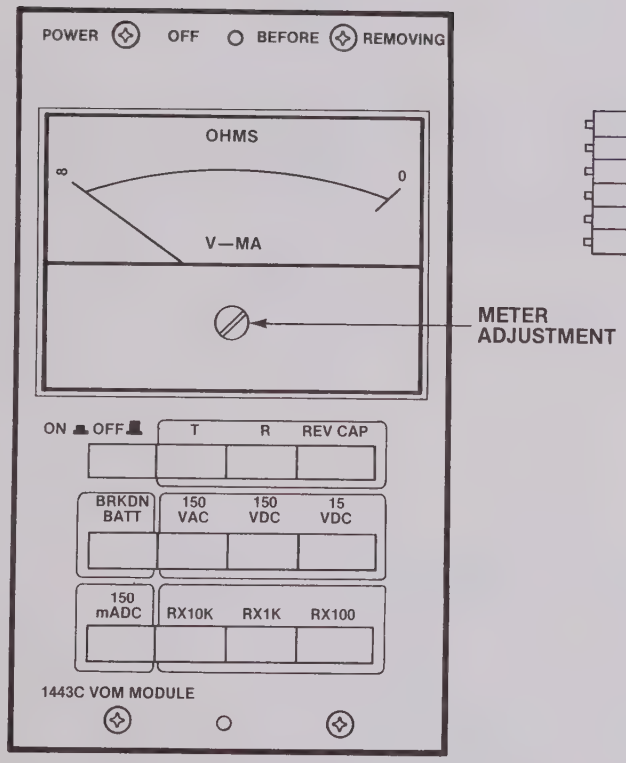


Figure 4-2. 1443C VOM Module

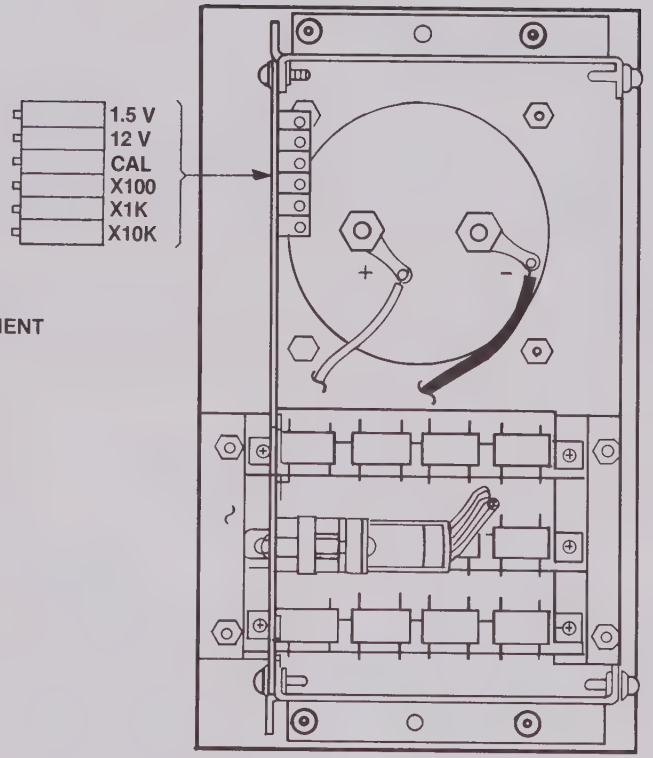


Figure 4-3. 1443C VOM Module Rear View

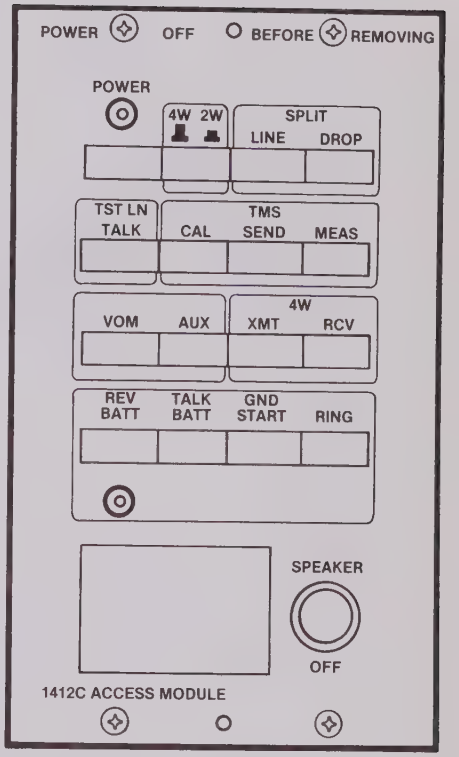


Figure 4-4. 1412C Access Module

STEP	ACTION	REQUIRED VALUE	CORRECTIVE ACTION	REFERENCE
5	Observe 1443C meter.	0 ohms	Replace 1443C Module. Replace 1412C Module.	Figure 4-2
6	Remove short from Cord Reel Panel/Jackfield **2W LINE**.			
7	Connect 120 kohms ±1% across Cord Reel Panel/Jackfield **2W LINE** tip and ring.			
8	Observe 1443C meter.	115k to 125 kohms	Replace 1443C Module.	Figure 4-2
9	Remove 120 kohms from Cord Reel Panel/Jackfield **2W LINE**.			
10	On 1443C, release **RX10K** button, and press **RX1K** button.			Figure 4-2
11	Connect short (0 ohms) across Cord Reel Panel/Jackfield **2W LINE** tip and ring.			
12	Observe 1443C meter.	0 ohms	Replace 1443C Module.	Figure 4-2
13	Remove short from Cord Reel Panel/Jackfield **2W LINE**.			
14	Connect 12 kohms ±1% across Cord Reel Panel/Jackfield **2W LINE** tip and ring.			
15	Observe 1443C meter.	11.5 k to 12.5 kohms	Replace 1443C Module.	Figure 4-2
16	Remove 12 kohms from Cord Reel Panel/Jackfield **2W LINE**.			

1443C PRIMARY TEST CIRCUITRY CALIBRATION CHECK (Continued)

STEP	ACTION	REQUIRED VALUE	CORRECTIVE ACTION	REFERENCE
17	On 1443C, release **RX1K** button, and press **RX100** button.			Figure 4-2
18	Connect short (0 ohms) across Cord Reel Panel/Jackfield **2W LINE** tip and ring.			
19	Observe 1443C meter.	0 ohms	Replace 1443C Module.	Figure 4-2
20	Remove short from Cord Reel Panel/Jackfield **2W LINE**.			
21	Connect 1200 ohms ±1% across Cord Reel Panel/Jackfield **2W LINE** tip and ring.			
22	Observe 1443C meter.	1150 to 1250 ohms	Replace 1443C Module.	Figure 4-2
23	Remove 1200 ohms from across Cord Reel Panel/Jackfield **2W LINE**.			
24	On 1443C, release **RX100** button, and press **150 VDC** button.			Figure 4-2
25	Connect 48 Vdc ±.5 Vdc across Cord Reel Panel/Jackfield **2W LINE** tip (+) and ring (–).			
26	Observe 1443C meter.	45 to 50 Vdc	Replace 1443C Module.	Figure 4-2
27	Remove 48 Vdc from Cord Reel Panel/Jackfield **2W LINE**.			
28	On 1443C, release **150 VDC** button, and press **15 VDC** button.			Figure 4-2

STEP	ACTION	REQUIRED VALUE	CORRECTIVE ACTION	REFERENCE
29	Connect 10 Vdc ±.1 Vdc across Cord Reel Panel/Jackfield **2W LINE** tip and ring.			
30	Observe 1443C meter.	9.75 to 10.75 Vdc	Replace 1443C Module.	Figure 4-2
31	Remove 10 Vdc from Cord Reel Panel/Jackfield **2W LINE**.			
32	On 1443C, release **10 VDC** button, and press **150 VAC** button.			Figure 4-2
33	Connect office ringing generator across Cord Reel Panel/Jackfield **2W LINE** tip and ring.			
34	Observe 1443C meter.	Ringing voltage ±5%	Replace 1443C Module.	Figure 4-2
35	Remove office ringing generator from Cord Reel Panel/Jackfield **2W LINE**.			
36	Release all buttons on 1412C and 1443C Modules. *Note:* Calibration Potentiometers (Figure 4-3) located at the top rear of the module, are factory set. However, if the required value in calibration steps 5, 12, and 19 are not met, potentiometers 10K, 1K and 100K respectively, may be adjusted.			Figures 4-2, 4-4

STEP	ACTION	REQUIRED VALUE	CORRECTIVE ACTION	REFERENCE
	Note: This procedure applies only to the "B" version of the 1462 Supervision Module and if an 8972 4W Level TMS Module is incorporated into the 1400 Test Facility. It is assumed that the TMS is calibrated and 600 ohm terminated. The sensitivity range of the TMS oscillator is between 25 and 32 dB. The potentiometers to be adjusted are located at the rear of the Supervision Module, on the SF Board. They are accessed through an opening in the rear of the 1400 Test Facility.			
1	Release all keys located on the 1400 Test Facility.			
2	On the 1412C Module, press power and **SPLIT/LINE** keys.			
3	On the 1462, press **SF** and **DROP/OFF HK** keys.			Figure 4-5
4	Patch the transmit line cord to the TMS measure jack and the receive line cord to the TMS **SEND** jack.			
5	On the 8972 Module, press switch **S4**.			Figure 4-6.

STEP	ACTION	REQUIRED VALUE	CORRECTIVE ACTION	REFERENCE
6	On the 1462, adjust potentiometer R3 for desired transmit line level as observed on the TMS.	User set	Replace 1462 Module.	Figure 4-7 Table 4-1
7	Repeat steps 5 and 6 for desired level settings with switches S-1, S-2 and S-3 on the 8972 Module and adjust potentiometers R9, R16, and R24 respectively on the 1462 Module.	User set	Replace 1462 Module.	Figure 4-6 Figure 4-7 Table 4-1
8	Set up the TMS to send the desired receive line sensitivity to be detected.			
9	On the 8972 Module, press switch **S-4**.			Figure 4-6
10	On the 1462, adjust receive line potentiometer R5 until **LINE** LED on the 1462 Module lights.	User set	Replace 1462 Module.	Figure 4-7 Table 4-1
11	Repeat steps 8, 9, and 10 for desired sensitivity levels for switches S1, S2, and S3 on the 8972 Module and potentiometers R12, R19, and R25 respectively on the 1462 Module.	User set	Replace 1462 Module.	Figure 4-6 Figure 4-7 Table 4-1
12	Release **SPLIT/LINE** key on the 1412C Module and press **SPLIT/ DROP** key.			Figure 4-5

1462B SF CALIBRATION (Continued)

STEP	ACTION	REQUIRED VALUE	CORRECTIVE ACTION	REFERENCE
13	Remove the transmit line cord from the **TMS MEAS** jack and the receive line cord from the TMS **SEND** jack.			
14	Patch the transmit line cord to the **SEND** jack and the receive line cord to the **MEAS** jack on the TMS.			
15	On the 1462 Module, release the **DROP/OFF HK** key and press the **LINE/OFF HK** key.			Figure 4-5
16	On the 8972 Module, press switch **S-4**.			Figure 4-6
17	On the 1462 Module, adjust potentiometer R6 for the desired receive drop level as observed on the TMS.	User set	Replace 1462 Module.	Figure 4-6 Table 4-1
18	Repeat steps 16 and 17 for the desired level settings with switches S1, S2, and S3 on the 8972 Module and potentiometers R13, R20, and R26 respectively on the 1462 Module.	User set	Replace 1462 Module.	Figure 4-6 Figure 4-7 Table 4-1
19	Set up the TMS to send the desired transmit drop sensitivity to be detected.			
20	On the 8972 Module, press switch **S-4**.			Figure 4-6

STEP	ACTION	REQUIRED VALUE	CORRECTIVE ACTION	REFERENCE
21	On the 1462 Module, adjust the transmit drop potentiometer R2 until the **DROP** LED on the 1462 lights.	User set	Replace 1462 Module.	Figure 4-7 Table 4-1
22	Repeat steps 19, 20, and 21 for the desired sensitivity levels for switches S-1, S-2, and S-3 on the 8972 Module and potentiometers R8, R15, and R23 respectively on the 1462 Module.	User set	Replace 1462 Module.	Figure 4-6 Figure 4-7 Table 4-1

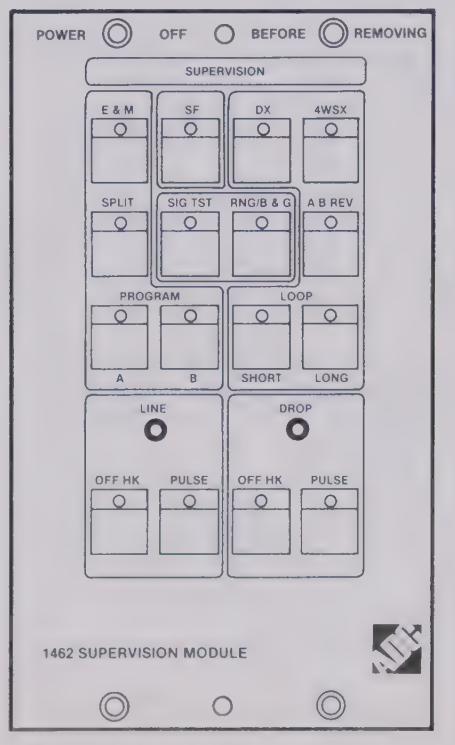


Figure 4-5. 1462 Supervision Module

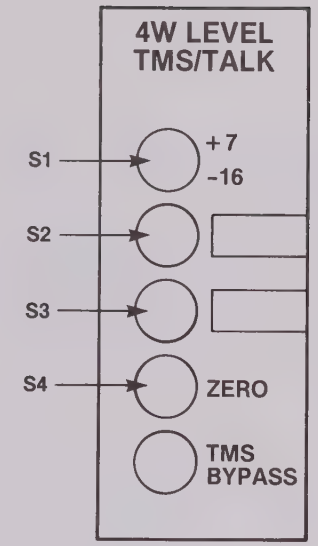


Figure 4-6. 8972 4W LEVEL TMS/Talk Module Front Panel

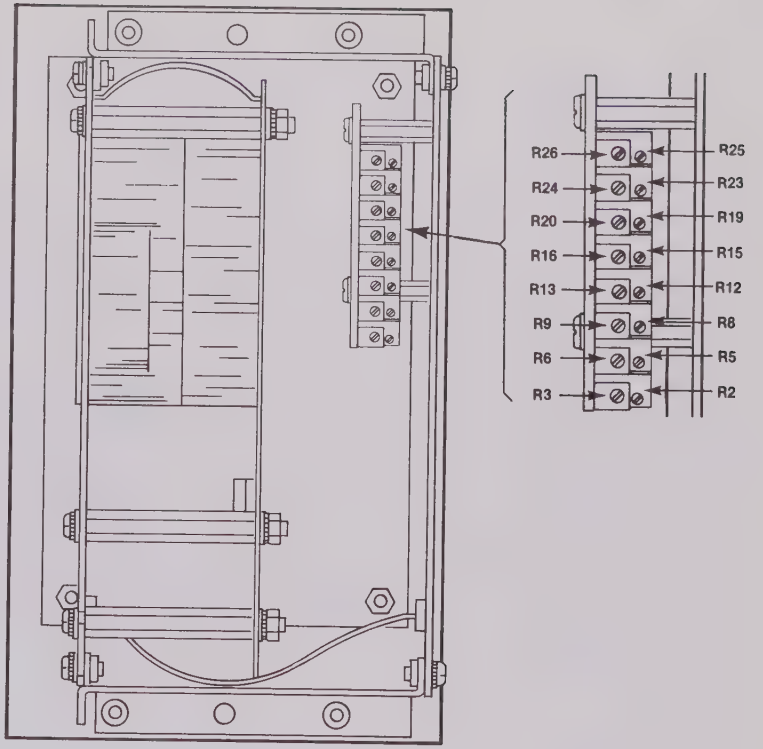


Figure 4-7. 1462B Rear View

Table 4-1

LEVEL POTENTIOMETERS 1462B				8972	USER	FACTORY SET LEVELS				ADJUSTMENT
LINE XMT	DROP RCV	DROP XMT	LINE RCV	SWITCHES	ADJ.	LINE XMT	DROP RCV	DROP XMT	LINE RCV	RANGE
R3	R6	R2	R5	S-4	A*	-20 dBm	-20 dBm	-31 dBm	-31 dBm	Output
R9	R13	R8	R12	S-3	B*	-20 dBm	-20 dBm	-31 dBm	-31 dBm	-40 to -10 dBm
R16	R20	R15	R19	S-2	C*	-20 dBm	-20 dBm	-31 dBm	-31 dBm	Input**
R24	R26	R23	R25	S-1	D*	-36 dBm	-13 dBm	-47 dBm	-24 dBm	-47 to -19 dBm

*A, B, C, and D represents level values determined by user.

**Drop XMT and Line RCV sensitivity range is from the level selected in A, B, C, and D to +10 dBm.

SECTION 5
GENERAL INFORMATION

CONTENTS PAGE

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3. CHARGES 5-2
4. REPLACEMENT/SPARE PARTS 5-2
5. RETURNED MATERIAL 5-2
6. CUSTOMER SUPPORT SERVICES 5-2

1. WARRANTY

1.01 Standard Factory Warranty (All products except PatchMate™ and PatchMate with Digital Switching).

ADC warrants to Buyer that the products sold hereunder are free from defects in material and workmanship under normal use and service, subject to exceptions stated herein. Products purchased are warranted for a period of one (1) year from the date of shipment to the original Buyer except for Prewired and Connectorized Longframe and Bantam Jackfields (other than DSX), VF transmission and signaling products and VF mounting shelves which are warranted for a period of five (5) years from the date of shipment to the original Buyer and except for expendable items such as patch cords, LED's, hole plugs, lamp caps, data circuit guard plugs, and designation strip cards which are warranted for a period of ninety (90) days from date of shipment to the original Buyer. If any products purchased from ADC are defective or do not conform to the contract for sale, Buyer shall so notify ADC promptly after receipt of the products and ADC, or its authorized or designated representative, shall have the right to inspect the goods on Buyer's premises. If ADC determines the product was defective at the time of delivery, at ADC's direction Buyer may either return the product with shipping charges prepaid to ADC and obtain a refund of the purchase price or return the defective product to ADC for repair or replacement. Claims for non-conforming orders will not be considered unless made in writing to ADC within ten (10) days after Buyer's receipt of the products. Since ADC's responsibility ceases upon delivery of the products in good order to a carrier, any claims for damage or shortage in transit must be brought against the carrier.

Limitations of Warranty

CORRECTION OF DEFECTS BY REPAIR OR REPLACEMENT OR REFUND OF PURCHASE PRICE TO BUYER SHALL CONSTITUTE FULFILLMENT OF ALL OBLIGATIONS TO BUYER AND ADC WILL NOT BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES OR PERSONAL INJURY OR FOR LOSSES, DAMAGES, OR EXPENSES DIRECTLY OR INDIRECTLY RESULTING FROM THE USE OF ITS PRODUCTS.

1.02 ADC assumes no warranty liability with respect to defects in its product caused by:

(a) Buyer's modification of the product, except as described in ADC's instruction manual, if applicable;

(b) Buyer's attempt to repair the product beyond removal of plug-in printed circuit boards, switch lamps, or fuses;

(c) Buyer's negligent, accidental, or other improper use of the product.

(d) Buyer's installation, operation, or maintenance of the product other than in a manner described in the instruction manual, if applicable.

1.03 ADC makes no warranty with respect to lamps furnished as part of any test system. ADC's warranty for equipment purchases from other manufacturers and distributors by ADC and supplied as part of an ADC system shall be limited to those warranties, if any, offered by the equipment manufacturer. ADC does not assume any warranty liability for any items purchased by Buyer either for drop shipment to ADC for factory installation and wiring or for installation and wiring by Buyer at his facility. Any repairs made by ADC after the warranty period are warranted for ninety (90) days from the date of repair or date of return shipment to Buyer, whichever is applicable

1.04 **THE ABOVE WARRANTY SUPERSEDES AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND ALL OTHER OBLIGATIONS OR LIABILITIES OF ADC, INCLUDING ANY WARRANTIES OF MERCHANTIBILITY AND FITNESS FOR A PARTICULAR PURPOSE.** No agent, distributor, or other party is authorized to make any warranties on behalf of ADC or to assume for ADC any other liability in connection with any of ADC's products.

2. REPAIR/EXCHANGE POLICY

2.01 Repair of ADC Equipment is done in general by substituting spare or repaired circuit boards or modules. All troubleshooting and repair of actual circuit boards must be done by ADC or an authorized representative. Any attempt to repair or modify ADC circuit boards without authorization from ADC voids the equipment warranty.

2.02 If a malfunction cannot be resolved by the normal troubleshooting procedures, then call ADC Customer Service as described in paragraph 6.02. A telephone consultation can sometimes resolve any apparent problems without the need to repair or replace any circuit boards.

2.03 If a telephone consultation indicates a need for repairs, ADC will authorize the return of the affected circuit boards for repair and provide a return authorization number. If time is critical, ADC can arrange to ship replacement circuit boards immediately. In any case, the defective circuit boards must be carefully packed and returned to ADC by the fastest shipping method. Address package to ADC, 4900 West 78th Street, Bloomington, Minnesota 55435 U.S.A. The return authorization number must be clearly marked on the outside of the package.

3. CHARGES

3.01 If the equipment is under warranty and the necessary repairs are covered by warranty, the customer's only responsibility is to pay the shipping cost to return the defective circuit boards. ADC will repair or replace the circuit boards at no charge and pay the return shipping charges.

3.02 If the equipment is not under warranty, or if the necessary repairs are not covered by warranty, ADC will charge the then current price for a repair or an advance replacement. Under an advance replacement, if the defective circuit board is not returned, the full price of a new unit will be charged.

3.03 If repairs necessitate a visit by an ADC representative, and the equipment is not under warranty, or if the repairs are not covered by warranty, ADC will charge the then current price of a field visit plus transportation charges from Minneapolis to the customer site and return.

3.04 There is normally no charge for telephone consultation, regardless of equipment warranty status.

4. REPLACEMENT/SPARE PARTS

4.01 Replacement parts, including but not limited to button caps and lenses, lamps, fuses, and patch cords, are available from ADC. Contact the Field Service Administrator at (612) 893-3038.

4.02 Spare parts can be purchased from ADC. Contact Sales Administration at (612) 893-3010 for a price quote and to place your order.

5. RETURNED MATERIAL

5.01 All return shipments require a return authorization number to be clearly marked on the outside of the package.

(1) Contact the ADC Field Service Administrator at (612) 893-3030 or write to ADC Magnetic Controls, 4900 West 78th Street, Bloomington, Minnesota 55435, Attn: Field Service Administrator, to obtain a return authorization number.

6. CUSTOMER SUPPORT SERVICES

6.01 The following customer support services are available by contacting ADC by telephone at numbers given, or by writing to ADC Magnetic Controls Company, 4900 West 78th Street, Bloomington, Minnesota 55435, to the attention of the appropriate department.

6.02 For assistance with pre-installation guidance, training, troubleshooting assistance, repair, replacement of printed circuit boards and field service contact Customer Service Engineering at (612) 893-3030.

6.03 For assistance with engineering problems, operational assistance and system interface, contact Applications Engineering at (612) 893-3020.

To the holder of this Manual,

In order to keep your Manual up to date as to changes and corrections, new applications, new or updated operating procedures, and new equipment options, please fill out and mail the attached, postage paid registration card.

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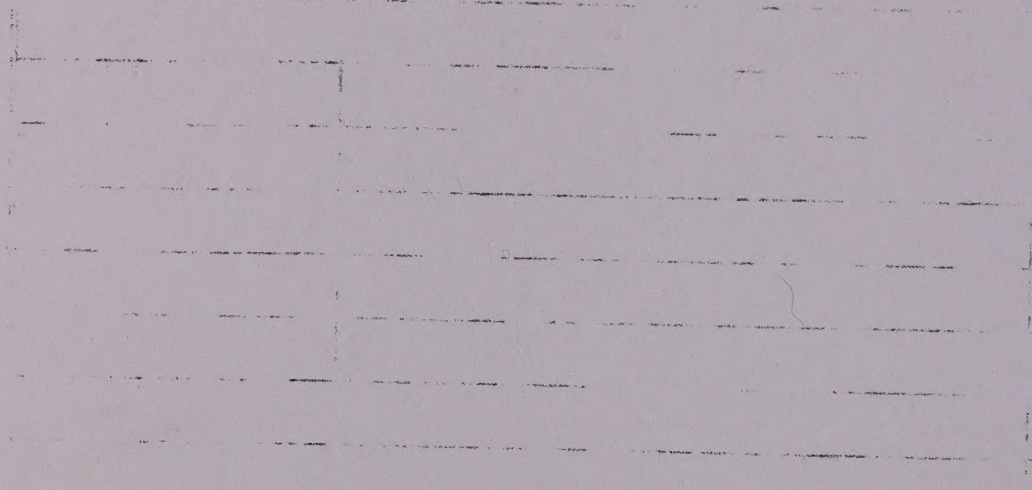
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